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no. 24-25
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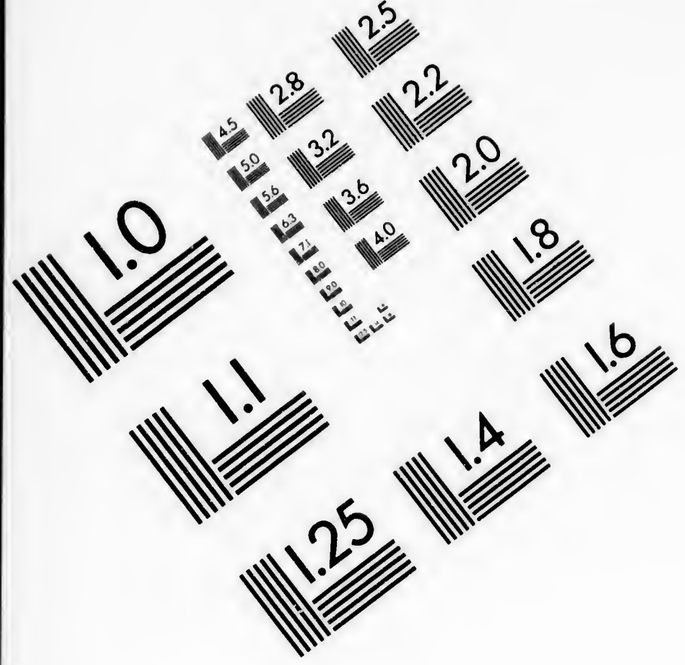

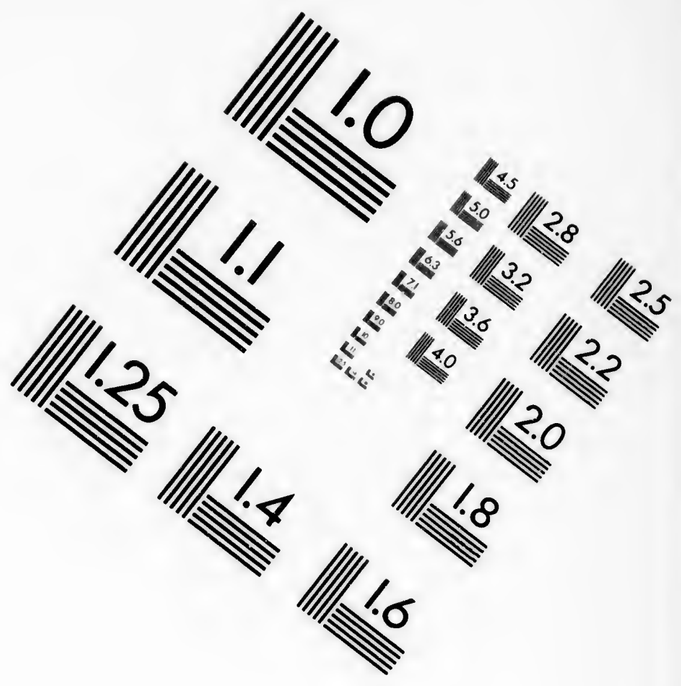

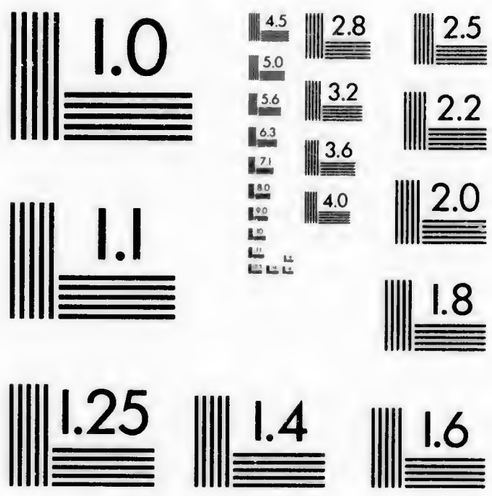

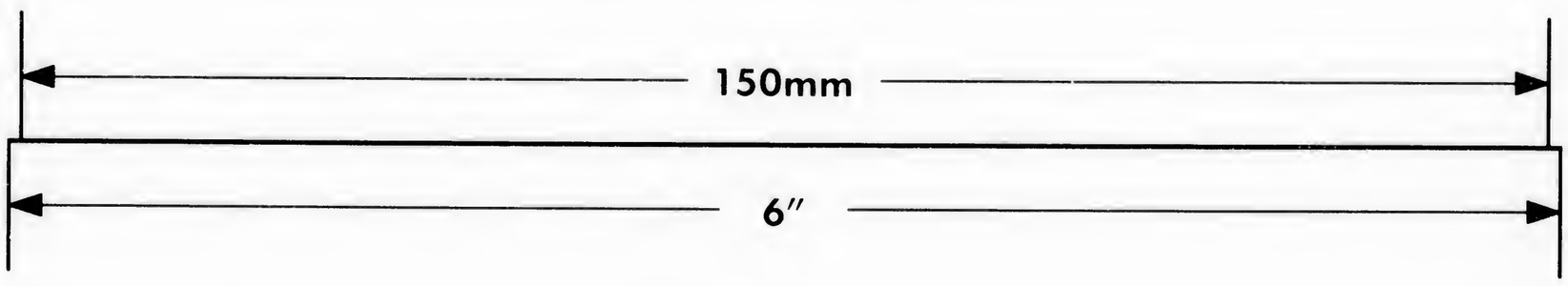

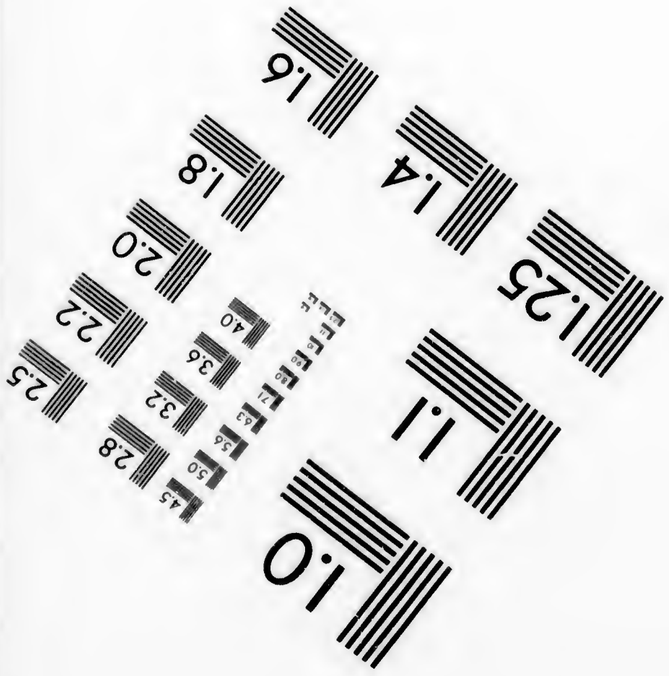

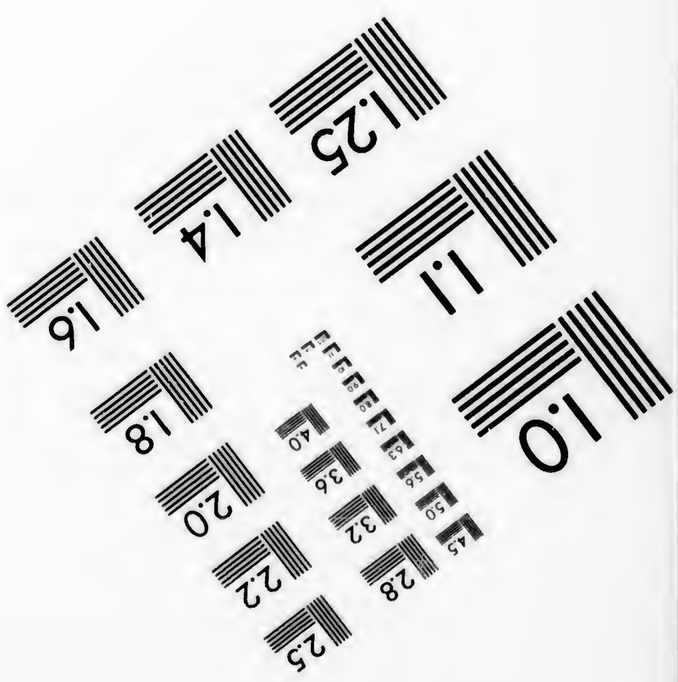

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TWENTY-FOURTH AND TWENTY-FIFTH

QUARTERLY REPORTS

OF THE

PENNSYLVANIA BOARD OF AGRICULTURE

PENNSYLVANIA BOARD OF AGRICULTURE, 1884.

MEMBERS EX-OFFICIO—His Excellency Governor R. E. Pattison; Hon. J. S. Africa, Secretary of Internal Affairs; Dr. E. E. Higbee, Superintendent of Public Instruction; Hon. J. B. Niles, Auditor General; Dr. G. W. Atherton, President Pennsylvania State College.

APPOINTED BY THE GOVERNOR—Dr. John P. Edge, Downingtown, term expires, 1886; Col. James Young, Middletown, term expires, 1885; Leonard Rhone, Centre Hall, term expires, 1887.

ELECTED BY COUNTY AGRICULTURAL SOCIETIES.

			Term expires.
Adams,	I. Garretson,	Bigler,	1885
Armstrong,	F. K. Patterson,	Freeport,	1886
Beaver,	A. L. McKibben,	Green Garden,	1885
Bedford,	Jos. E. Noble,	Waterside,	1886
Berks,	J. G. Zerr,	Geiger's Mills,	1886
Blair,	J. D. Hicks,	Tyrone,	1886
Bradford,	H. L. Scott,	Towanda,	1886
Bucks,	E. Reeder,	New Hope,	1887
Butler,	John Dindinger,	Zelienople,	1885
Centre,	E. W. Hale,	Bellefonte,	1885
Chester,	Thos. J. Edge,	West Chester,	1887
Clinton,	Joel A. Herr,	Cedar Springs,	1887
Columbia,	Chandlee Eves,	Millville,	1885
Crawford,	M. W. Oliver,	Springboro',	1886
Cumberland,	C. H. Mullin,	Mt. Holly Springs,	1885
Dauphin,	G. Hiester,	Harrisburg,	1885
Delaware,	Elwood Harvey,	Chester,	1886
Erie,	J. C. Thornton,	Avonia,	1886
Indiana,	A. D. Sutton,	Indiana,	1886
Jefferson,	Jas. McCracken, Jr.,	Frostburg,	1887
Juniata,	Prof. D. Wilson,	Port Royal,	1885
Lancaster,	H. M. Engle,	Marietta,	1886
Lawrence,	D. H. Wallace,	New Castle,	1885
Lebanon,	C. H. Lantz,	Lebanon,	1885
Lehigh,	J. P. Barnes,	Allentown,	1887
Luzerne,	John B. Smith,	Kingston,	1885
Lycoming,	D. H. Foresman,	Williamsport,	1885
Mercer,	Robert McKee,	Mercer,	1887
Montgomery,			
Montour,	M. D. L. Sechler,	Danville,	1886
Northampton,	Asher D. Shimer,	Bethlehem,	1885
Northumberland,	J. McFarland,	Watsontown,	1885
Somerset,	C. C. Musselman,	Somerset,	1886
Schuylkill,	J. S. Keller,	Orwigsburg,	1887
Sullivan,			
Susquehanna,	J. F. Butterfield,	Montrose,	1886

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			Term expires.
Tioga,	J. W. Mather,	Wellsboro',	1886
Union,	Philip Frederick,	Lewisburg,	1887
Venango,	M. C. Beebe,	Pleasantville,	1886
Warren,	Emry Davis,	Sugar Grove,	1886
Washington,	John McDowell,	Washington,	1887
Wayne,	N. F. Underwood,	Lake Como	1885
York,	W. S. Roland,	York,	1886

OFFICIAL LIST.

President.

His Excellency R. E. Pattison.

Vice Presidents.

Dr. G. W. Atherton. John McDowell. M. C. Beebe.

Executive Committee.

His Exc'y R. E. Pattison, J. P. Edge, J. A. Herr,
C. C. Musselman, N. F. Underwood, G. Hiester,
J. P. Barnes, E. Reeder, T. J. Edge, (*ex officio.*)

Advisory Committee.

J. P. Edge, J. P. Barnes, G. Hiester,
Thomas J. Edge, (*ex officio*)

Secretary.

Thomas J. Edge, Harrisburg.

Botanist.

Thomas Meehan, Germantown.

Pomologist.

Josiah Hoopes, West Chester.

Chemist.

Prof. W. H. Jordan, State College.

Consulting Veterinary Surgeon.

Prof. R. Shippen Huidekoper, University of Pennsylvania.

Veterinary Surgeon.

Dr. F. Bridge, West Philadelphia.

Entomologist.

Prof. W. A. Buckhout, State College.

Microscopist and Hygienist.

Dr. H. Leffman, Philadelphia.

Ornithologist.

B. Harry Warren, West Chester.

Meteorologist.

Prof. I. Thornton Osmond, State College.

Fishculturist.

Capt. M. P. Peirce, Philadelphia.

Mineralogist.

Prof. F. A. Genth, University of Pennsylvania.

Geologist.

Prof. J. P. Lesley, State Geological Survey.

Stenographer.

Col. H. C. Demming, Harrisburg.

CONDENSED PROGRAMME OF THE AUTUMN MEETING.

Held at Bedford, commencing Wednesday, October 15th, 1884.

ORDER OF BUSINESS.

WEDNESDAY MORNING, OCTOBER 15TH, 1884.

Call to order at 11, A. M. Adjournment at 12, M.

1. Address of Welcome, by Hon. WM. HARTLEY, President of the Bedford County Agricultural Society.
2. Reply, on behalf of the Board, by Hon. ROBERT E. PATTISON, Governor of the Commonwealth and President of the Board.
3. Miscellaneous business.

WEDNESDAY AFTERNOON, OCTOBER 15TH, 1884.

Call to order at 2.30, P. M. Adjournment at 5.30, P. M.

1. Roll-call of members.
2. Appointment of Committee on Credentials.
3. Reception of credentials of members.
4. Reception of credentials of delegates.
5. Reading minutes of previous meeting.
6. Reports of committees.
7. Discussion of the reports of committees.
8. New business.
9. Unfinished business.

ESSAYS AND DISCUSSIONS.

10. *What Inducement does Agriculture offer to Young Men about to Choose a Profession?*—By G. Hiester, member from Dauphin.
11. "*Father did so, and He Knew.*"—By M. W. Oliver, member from Crawford.
12. *Forest and Rainfall.*—By the Secretary.

WEDNESDAY EVENING, OCTOBER 15TH, 1884.

Call to order at 7.30. Adjournment at 9, P. M.

Lecture.—By Dr. Thomas Meehan, Botanist of the Board. Subject, *Flowers in Connection with Agriculture.*

THURSDAY MORNING, OCTOBER 16TH, 1884.

Call to order at 8.30, A. M. Adjournment at 12, M.

1. *Agricultural Economy.*—By J. G. Kreichbaum, Esq., of Woodbury, Pa.
2. *Different Results in Farming.*—By J. P. Barnes, member from Lehigh.
3. *The Relation of Agriculture to other Industries.*—By George W. Atherton, President of the Pennsylvania State College, and member of the Board.
4. *What can the Pennsylvania Farmer Substitute for our Decreasing Exports of Grain and Agricultural Products?*—By Hon. Leonard Rhone, Master Pennsylvania State Grange, and member of the Board.
5. *How to Plant and Manage an Orchard.*—By H. M. Engle, member from Lancaster.

THURSDAY AFTERNOON, OCTOBER 16TH, 1884.

Call to order at 2.30, P. M. Adjournment at 5.30.

1. *The American Horse.*—By Dr. J. W. Medara, of Baker's Summit, Pa.
2. *Breeds and Breeding of Horses.*—By J. W. Mather, member from Tioga.
3. *Natives, Grades, and Thoroughbreds for the Average Pennsylvania Farmer.*—By Hon. N. F. Underwood, member from Wayne.
4. *The Sanitary Arrangement of Farm Buildings, with Some Hints for their Improvement.*—By Dr. H. H. Hill, of Everett, Pa.
5. *Psychology.*—By Dr. E. Harvey, member from Delaware.

THURSDAY EVENING, OCTOBER 16TH, 1884.

Call to order at 7.30, P. M. Adjournment at 9.30, P. M.

Lecture.—By Dr. H. Leffman, Microscopist of the Board. Subject, *Microscopic Life as a Cause of Disease in Animals and Plants.*

Address.—*The Settlement of the Southern Border Counties by the Scotch-Irish.*—By Hon. J. Simpson Africa, Secretary of Internal Affairs.

MINUTES OF THE AUTUMN MEETING.

Held at Bedford, Pa., commencing Wednesday, October 15th, 1884.

Board called to order at 11.20, A. M., by His Excellency R. E. Pattison in the chair.

On behalf of the Bedford County Agricultural Society and the citizens of Bedford, Colonel William Hartley addressed the Board as follows:

Mr. President and Gentlemen of the State Board of Agriculture:

The mythology of the Greeks attributes to Ceres the invention of the art of tilling the soil. Ceres imparted these to Triptolemus, of Eleusis, and sent him as her missionary round the world to teach mankind the best modes of plowing, sowing, and reaping. In gratitude for this, more than three thousand years ago, in honor of Ceres, the Eleusian Mysteries, by far the most celebrated and enduring of all their religious ceremonies, were established.

The people everywhere throughout the great Commonwealth of Pennsylvania esteem each and every member of the State Board of Agriculture as the Greeks did Triptolemus. Here, as everywhere, smiles of welcome greet you; and if not detected in every countenance, let it be attributed to the fact that this being your first council held in Bedford county, you are not known, your mission not understood.

"Far from the madding crowd's ignoble strife."

Your paths are ways of innocence and pleasure through God's country, for "man made the town." Your business is with flocks and herbs and cultivated fields, with fruits and flowers. Your council is wisdom's workshop. In springtime you go forth bearing good seed of profit, trees, shrubs, and vines of life and pleasure, to be planted and cultivated with the hope of feeding the hungry and satisfying the cravings of even civilized stomachs.

In summer, with the sweat of honest industry, decking in crystal jewels your tawny brows, you come from the fields of golden grain, and from the meadows, bearing

"Fragrance, fragrance exquisite!
Of new-mown hay, of wild thyme, dewy washed, and gales ambrosial."

And now in autumn, when the brown chestnuts smile through the velvety lips of the bristling burs, when the fallen leaves are rustling in the paths so recently frequented by our city visitors, and darkening the crystal waters of our salubrious springs; now "when the frost is on the pumpkin," when the ox, like Jove's, is silent over his fodder, you come to teach us how to gather the fruits of our summer's labor, how to provide good shelter for our flocks and herds, and how best to spend the weary hours of the tedious ice season.

How needless an "Address of Welcome" to missionaries such as you!

The State Board of Agriculture has done much in the interest of our farmers, but the field is limitless, and embraces all science. The productive capacity of the earth will only begin to be realized when food shall be required to supply the wants of the unborn millions who shall succeed us.

On the old turnpike passing through our town, the ruts of the Concord coaches and Conestoga wagons may still be seen. When this road was one of the great thoroughfares to the West, our farmers had a reliable home-market for all that the virgin soil so bounteously produced, and received remunerative prices. In the progress of the age, railroads and steam navigation destroyed the old ways and old markets, and through discrimination and other equalizing influences our farmers have been brought into closer competition with the great West, and are now only beginning to realize that from the same farms and same mode of cultivation and products, they, the sons, are not adding acre to acre and farm to farm as their fathers did. But in most instances, off less land the sons live better, enjoy more of the luxuries of life, ride to market on oil-tempered springs and covered vehicles instead of rough Dearborn wagons and astride or on saddles, as the fathers and mothers did fifty years ago.

Improved machinery, though expensive as compared with the rude implements of those days, lightens many of the burdens of the farm. Spinning, weaving, candle-making, quilting, wool-dying, &c., &c., are almost lost arts with many of our farmers' wives. Nevertheless, our people have yet to learn many lessons in farm economy. The great importance of thorough cultivation by, in most instances, reducing the amount of land; the great secret of profitable stock-raising which they are so slow in comprehending—that it costs no more to raise the very best breeds of horses, cattle, sheep, swine, and poultry, suited to the locality, than the common and inferior sorts; that a breed of cattle profitable in the far West may not pay here; that a breed of sheep, healthy in Canada, might soon become diseased in our moist and changeable winter air; that certain fruits, dairy and sheep products, together with a strong, hardy race of horses, may be more profitable than further endeavoring to compete with the West in cultivating wheat and other cereals to so large an extent.

Success in farming depends much upon good judgment and true economy. Many farmers are kept poor all their days through downright stinginess and a morbid fear of losing or coming to want. They are afraid to spend fifty dollars in order to make a hundred. They are almost afraid to set a dozen of eggs, worth fifteen cents, under a hen for fear she may fail to hatch. They are afraid to buy improved breeds of animals, though their better judgment advises, from fear of the first outlay. So many drudge along through life with nothing superior about them—nothing in which to have deserving pride.

Thousands of dollars have been ignorantly expended in our country for the service of so-called blooded horses which were only mongrels. Thousands of farmers seem content with raising, year after year, mere grades calling them Durhams or Alderneys, Percherons or Hambletonians, Cotswolds or Southdowns, believing lies, deceived and deceiving. "Blood will tell." Pedigrees may lie. Whatsoever a man sows, that shall he reap. "Beauty breedeth beauty." But to get it in the first place, pay for it. That is your duty. The farmer who determines to excel in raising any profitable crop or any favorite breed of animals suited to his locality, in honesty and purity, must succeed. And furthermore, there is a conscious satisfaction, a feeling of self-respect, in the production or ownership of a genuine article akin to that of the owner of a diamond of the first water, as compared with the feelings of sham of one who walks behind the fictitious glitter of paste.

But, gentlemen, whilst you are so welcome everywhere in your mission to enlarge and improve the food-products of the State, by teaching the fathers and sons the best modes of cultivation, by unfolding the secrets of breeding, rearing, and fattening animals that the best and most desirable results may be obtained, is it not high time that more should be done to lighten the burdens of the mothers and daughters of all households, whether in country, city, or village?

The production of food material is one thing. The proper preparation of that material for human stomachs opens a field for inquiry, thought, and education of equal or greater extent. The burdens of men are distributed, as they ever have been, among enlightened people. But, alas! the work of the household in this age and country is done by a few, whilst the many are growing up in idleness, and often worse than idleness. In this age of sewing-machines, house organs, pianos, light literature, and changeable fashions, why has the good old science of the kitchen laboratory been so sadly neglected? Why is it that, though the wages of culinary artists have been more than doubled within the last thirty years, there is such a scarcity all over the land of household help? And yet the streets of all our towns and villages are full of able-bodied, rosy-cheeked girls. Most of these are growing up in blissful expectation of marrying and being kept. Kept! Would to God that every true mother in the land would teach her daughter to abhor that word kept! (Applause.) The wife of the laboring man who does well her part in preparing the food and attending to her household is not kept. The wife of the farmer or millionaire, who oversees and directs properly the household affairs of her husband, is not kept.

Why is it that kitchen mechanics and artists are regarded by many as menials "hired girls?" Why, the President of the United States is a hired man. Railroad magnates are hired men, many of them. Let the girls when studying French translate and ponder those seven simple words of Voltaire: "What a divine mortal is a cook!" How many, in their poetical moods, ever read or considered the truth of Doctor Walcott's couplet in Peter Pindar, as follows:

"The turnpike road to people's hearts, I find
Lies through their mouths, or I mistake mankind."

I would not have our girls made drudges or household slaves, but I would have all, no matter how rich in this world's goods, whilst aiming at the highest culture of mind and body, learn well household arts and economies, not only in theory, but by frequent practice, if for no other reason than for "the glorious privilege of being independent."

How utterly helpless is that young married woman who is ignorant of the first principles in the foundation of a "square meal." When the cook suddenly leaves or gets sick, she is in a quandary whether to get out the horse to draw the tea, or run for mother. Hundreds of poor girls now walk the streets of our cities and villages, leading lives of shame, who gladly would rather be employed in respectable families as cooks and maids of all work. But, alas! through false pride, or ignorance of mothers, they learned nothing of household art and kitchen science, and think it now too late. Their young lives were misdirected. Much of the unhappiness of married life begins on account of the *freight* which passes over the "turnpike road" of the old poet.

Girls are not taught to cook, nor to smooth the bosom of a "boiled shirt." They get married nevertheless. The bread-and-butter period of life begins. The vexatious springs of ignorance of household affairs soon water the rosy cheeks. Bad bread, worse cookery, abominable mixtures, soon cool the ardor of the husband's love. Then the plowshare of complaint makes furrows on the wife's brow.

Let all girls be taught self-reliance in a knowledge of preparing food properly for cultivated stomachs, and when this cannot be well done at home, let them earn an honest living, and at the same time acquire useful knowledge in neighbors' families. Surely, your love and veneration for our mothers is not lessened in rememberance of their skill in the preparation of toothsome and wholesome food. There should be a State Board of Domestic Economy to encourage the science of properly preparing food and the domestic arts.

In the Crimean war the British government found it necessary to send Soyer to the camps to improve the bad rations furnished the soldiers.

The great scarcity of educated housemaids and cooks all over the land, together with the dependence and helplessness of wives in many instances, become the bane of housekeeping. Let the knowledge of the arts of the household and the kitchen sciences be more highly honored. Let the girls whose artistic hands and orderly minds, whose exquisite taste and good judgment render them fully competent to manage a house from cellar to garret, and, if need be, to prepare a repast that should satisfy any sensibly educated and healthy stomach rank higher than those who claim, at most, but a knowledge of some specialty. Let the girls who grow up in ignorance of all household work be regarded among women as "dudes" are among men. Woman's province is in the house. Let her be master of that situation.

If, as stated by the gentlemen who addressed you two years ago at your Washington meeting, "the records of our insane asylum at Dixmont show that farmers' wives are in excess," and if, as he alleged, the hard labor, many cares, and endless work of the farm-house have a tendency to shorten life and to produce misery, resulting often in insanity, is it not high time for general philanthropic action in aid of women? This can be done in part by affording conveniences, and by labor-saving machinery and appliances, but principally through industrial education by encouraging the many to help the few, by teaching *all* girls the domestic arts and their household duties, by increasing the Marthas, and thereby make the service light for all. When this is done the music of the household will harmonize with the songs of progressive field industry. Then will the average home be a place of refuge and solace to all conditions of men who, with brain or brawn, are honestly endeavoring to do well their part in the world's great work-shop.

On behalf of the members of the Board, His Excellency replied as follows:

MR. HARTLEY AND CITIZENS OF BEDFORD, AMONG WHOM I OUGHT AND, OF COURSE, DO INCLUDE THE LADIES: I find by the programme that I am to respond, on behalf of the State Board of Agriculture, to the address of welcome delivered by you. In doing so, I desire to say, on behalf of this Board, that we thank you for the kind words of welcome that you have extended, and for the opinions and for the consideration of the subject that you have expressed in your address.

We come to the county of Bedford with a full knowledge of its historical relation to the State of Pennsylvania—one of the oldest counties of the State—a county in which the name of the first President of the United States, as a visitor towards the close of the last century, has been associated in connection with the whisky riots of western Pennsylvania, with a knowledge that you, at that time, entertained three Governors of three different States and a Secretary of the Treasury of the United States, present to superintend the distribution and the compensation connected with the movements of the troops and of the commissary department connected during that insurrection. So that Bedford county possesses a historical relation that is interesting to the Board of Agriculture and citizens of the State of Pennsylvania.

We come with a knowledge of the value of your magnificent springs, the history and benefits of which have been scattered throughout this country, and, probably, throughout the world. Citizens have visited them from all parts of the Union, and scientific men of other countries have passed upon their merits.

We come, also, with a knowledge of the richness and fertility of your valleys, and the beauty and glory of your mountain scenery. We come appreciating the agricultural wealth of the county of Bedford and the importance of the agricultural interests of Pennsylvania.

This Board is no small part of the State government. It represents one of its largest interests, but it has only been within a few years that the labors of the Board and its efforts in direction of the agricultural interest have been appreciated. The Board today, I think I can say for them, feel that they are having a cordial coöperation and an appreciation, not only among the agricultural interest, but among the citizens at large. They come, therefore, into your midst to discuss questions relating to the cultivation of the land, to the treatment of the soil, and the enlightenment of the people interested in that particular avocation; and they desire to say to you that, in the discussions of the questions and in the reading of the papers, the citizens of Bedford and the farmers of Bedford county are all invited to participate, that any thought or suggestion that may occur to any of you, bearing upon any subject, will be very heartily listened to and cordially supported in the discussions of the meetings of this Board in the future.

I recollect hearing a story told as a tradition among the Indians. It was something like this: That there was a belief that the Indian who took his own life ought to remain unburied upon the face of the earth unless something good could be said about him. There was one poor old Indian—one of the worst of his tribe—that, at the end of his days, probably oppressed with the cares of Indian life, took his own life. The tribe assembled about the dead body, formed a circle, and marched around it. The chief looked upon it and, after some time, said in his Indian way, "He was a grand old rascal!" The other chief, or the second in command, approached the body and said that he was a great liar; and so on the members of the tribe moved around the body, one saying this that was bad and another that "he was an old hypocrite and we never could trust him," until nearly all the tribe had passed upon the body, and the indications were very marked that the poor old Indian's body would remain unburied. It seemed as if nothing good could be said to his memory. At length the last Indian approached, and here was the last chance. It was a poor old Indian that looked upon the dead—so little thought of himself that he was placed at the end of the line—and he stopped and stood some moments as if in deep thought. Finally he said, shaking his head, "He was a good feeder." They all raised their hands in token of joy, for they rejoiced in that while they could not say anything good of the deceased Indian, that, finally, some one could say something that his body might thereby be placed under ground. So, in Indian fashion, he was doubled up and with the body in an upright position, with tomahawk and bow by his side, he was buried with his face toward the rising sun.

I want to say to you on behalf of the Agricultural Board that if we lack in any other good quality we lay claim to that of the poor Indian. But we trust it will be said of us in addition that we have been good feeders of your minds during our stay in your midst.

But there is one other point in conclusion, and that is this: I don't know that I am expressing the opinion, and I don't wish to be so understood by you, sir, as expressing the opinion of this Board, but I do desire to say in regard to some part of your kind welcome that I do not altogether or quite thoroughly concur in it in every particular. I do not concur with you that cooking is a lost art. I believe we have just as good cooks among our wives and daughters, and just as capable of setting that which is wholesome before us as any that have ever graced the earth. I believe they can bake potatoes and bread, and broil beef steak in every way equal to the best cook that ever lived. I believe they can put upon the table of the husband and father puddings and other nice dishes as well prepared as ever adorned any tables in the past. I believe, sir, the weakness is not so much in the cooking as in the stomachs of men. The outside scientific dishes of these days have developed to such an extent, with the ability to apply French names and French treatment, that their different characteristics are wonderfully mysterious. Therefore, I think the home cook is not to be blamed for the utter impossibility to be able to satisfy the demands of the modern stomach developed to the highest and fullest extent by unfathomable combinations and a French dictionary. If people would be satisfied with the cooking of our mothers—if they would take their buckweat cakes and butter, their baked potatoes, the cornbread, and fine, fat bacon, with a cup of good coffee—there would be no trouble at all about the cook. But there is the growing weakness to have even common food dressed in a different style, with strange varieties of wine at the table, until it is impossible to prepare anything at home that will meet the growing unnatural appetite. Then there are liquids and salads in the way of "table-dressings" so profoundly prepared that I leave to Professor Meehan or Professor Leffman the task of analyzing what they are, for I never could discover.

With the exception of the few words referred to, I altogether concur in the very kind remarks we have just heard, and I trust you will try to receive this reply in the kindly spirit intended, and that you will convey our sincere gratitude to your fellow-citizens of Bedford for this very hearty and cordial welcome to the State Board of Agriculture.

After the announcement of the programme and an invitation to those present at the sessions of the Board, to assist in the discussions, on motion, adjourned to meet at two thirty, P. M.

WEDNESDAY AFTERNOON *October, 15, 1884.*

Board called to order at two thirty, P. M., by Dr. G. W. Atherton, Vice President, in the chair.

Present—His Excellency R. E. Pattison, J. Simpson Africa, Secretary of Internal Affairs, Dr. G. W. Atherton, President State College, Dr. J. P. Edge, I. Garretson of Adams, F. K. Pattison of Armstrong, J. E. Noble of Bedford, J. G. Zerr of Berks, H. L. Scott of Bradford, E. Reeder of Bucks, E. W. Hale of Centre, T. J. Edge of Chester, J. A. Herr of Clinton, Chandlee Eves of Columbia, M. W. Oliver of Crawford, G. Heister of Dauphin, E.

Harvey of Delaware, James McCracken, Jr. Jefferson, H. M. Engle of Lancaster, J. P. Barnes of Lehigh, J. B. Smith of Luzerne, D. H. Foresman of Lycoming, R. McKee of Mercer, M. D. L. Sechler of Montour, A. D. Shimer of Northampton, C. C. Musselman of Somerset, J. S. Keller of Schuylkill, J. F. Butterfield of Susquehanna, P. Frederick of Union, M. C. Beebe of Venango, Emery Davis of Warren, N. F. Underwood and W. S. Roland. Dr. H. Leffmann, Microscopist, and Thomas Meehan, Botanist of the Board were also present.

The chair named Messrs. Foresman, Oliver, and Barnes, a committee on credentials of members and delegates, when, on motion, the name of Mr. Musselman was substituted for that of Mr. Oliver, who was released, with permission to call a meeting of the Committee on the Apiary during the session of the Board.

On a call for reports from standing committees, Captain M. W. OLIVER, on behalf of the Committee on the Apiary, presented and read the second annual report of that committee, the matter of which was discussed by Messrs. Butterfield, Engle, Hiester, Oliver, and Atherton.

Committee on credentials, through Mr. FORESMAN, chairman, reported that they had received the credentials of J. McCracken, Jr., elected by the Jefferson County Agricultural Society, and of J. P. Barnes elected by the Lehigh County Agricultural Society, and, finding them correct, were unanimous in recommending that they be admitted as members of the Board for the term of three years.

They also reported that Buffalo Grange No. 531 had elected S. B. Carpenter, A. C. Arnold, M. C. Miller, and William Mausberry to represent them at the meeting, and, further, that Bedford Grange No. 619 had elected J. A. Still, J. C. Evans, and T. J. Beegle as their representatives; the committee having been furnished with the proper certificates of election, recommended that they be received as duly accredited delegates, which, on motion of Mr. SMITH, seconded by Mr. ENGLE, was agreed to.

On behalf of the Committee on Legislation, Mr. BEEBE, of Venango, presented the following resolution with the information that the commmittee would, after further consideration, present drafts of several acts. Said resolution was as follows:

Resolved, That Pennsylvania's greatest need for agricultural development is an experiment station, practical and analytical, and that we earnestly request and urge the necessary legislation at the coming session of the Legislature.

After discussion by Messsr. NOBLE. MUSSELMAN ENGLE, BEEBE, Dr. EDGE, and BARNES, adopted.

On behalf of the Committee on Silk and Silk Culture, Dr. EDGE and Dr. BARNES made verbal reports, which were accepted.

Mr. REEDER, of Bucks, on behalf of the Committee on Dairy and Dairy Products, presented drafts of three bills relating to the manufacture and sale of oleomargarine and imitation butter, which, after reading and partial discussion by Dr. LEFFMAN and Mr. HIESTER, were referred back to the committee for revision and the afternoon session fixed for their discussion and final consideration.

The Committee on the Preservation of Useful Birds reported attention to their duty, and asked for a modification of the title of the committee, which, on motion of Mr. FORESMAN, seconded by Mr. SCOTT, was granted.

The special committee on roads, consisting of Messrs. Musselman, Reeder, Beebe, Mather, and Rhone, reported a draft of a general road law, which, after discussion by Messrs. MUSSELMAN, HARVEY. BEEBE, BARNES, and FORESMAN, was referred back to the committee for reconsideration and presentation to the annual meeting.

Mr. REEDER, of Bucks, offered the following as an amendment to the general road law:

Resolved. That it is the sense of this Board that section thirty-four of the general road law be so amended as to read, after the words "may direct," so as to give such persons full opportunity to work out one half of their respective taxes, and that the remaining half of the money collected may be expended in the purchase of such improved appliances as may be found necessary to make and keep the roads in good repair.

Which, after discussion by Messrs. REEDER, MCKEE, Dr. EDGE, MUSSELMAN, and SECRETARY, was referred to the special committee on roads.

On behalf of the Committee on Fruits and Fruit Culture, H. M. ENGLE, chairman, presented a report, which was accepted and ordered printed.

On motion of Mr. BARNES, of Lehigh, adjourned until seven, P. M.

WEDNESDAY EVENING, *October 15, 1884.*

Board called to order at seven, P. M., and after the transaction of miscellaneous business until seven thirty, P. M., Thomas Meehan addressed the meeting, in accordance with the published programme, on "Flowers in Connection with Agriculture." (Published elsewhere.)

THURSDAY MORNING, *October 15, 1884.*

Board called to order at eight forty-five, A. M., by Dr. G. W. Atherton, Vice President, in the chair.

On motion, Mr. HIESTER, of Dauphin, read an essay in answer to the question "What Inducement Does Agriculture Offer to a Young Man about to Choose a Profession?" which, after discussion, was referred to the Secretary for insertion in the published reports of the Board. Mr. BARNES, of Lehigh, then read an essay upon "Different Results in Agriculture," the subject-matter of which was discussed by Messrs. OLIVER, BARNES, ENGLE, BEEBE, ZERR, DAVIS, REEDER, SMITH, EVES, HERR, HARVEY, Dr. EDGE, LUTZ, ATHERTON, and SECRETARY.

Dr. G. W. ATHERTON, President of the State College, then read an essay on "The Relation of Agriculture to Other Industries."

On motion of Mr. KELLER, seconded by Mr. SMITH, Mr. ENGLE, of Lancaster, then addressed the Board in answer to the question, "How to Plant and Manage an Orchard," which, after full discussion, was adopted for publication in the annual report of the Board.

On behalf of the Committee on Forests and Forestry, Dr. W. S. ROLAND, of York, presented their semi-annual report, which was received after discussion and referred. The SECRETARY then called up the subject of a careful examination into the effects of forests upon climate and rainfall, as alluded to in his essay read at the close of the evening meeting, and after the discussion the following was adopted: "*Resolved*, That this Board recommend that the Legislature at its next session authorize the Governor to appoint a temporary commission on Forests and Forestry, to consist of not more than five, who shall serve for two years, and who shall, after giving the question of the effect produced by forests proper consideration, make report to the Governor and Legislature, and shall make such recommendations as shall seem to them best calculated to prevent the bad results following the rapid destruction of our forests; *Provided*, That the said com-

mission shall receive nothing but for actual and necessary traveling and clerical expenses, which should be limited to a reasonable amount.

Adopted, and the Secretary directed to furnish His Excellency the Governor with a copy of the resolution.

On motion of Mr. REEDER, the discussion of the proposed acts in relation to oleomargarine and imitation butter was made the first business of the afternoon session.

On motion, adjourned to 1.45, P. M.

THURSDAY AFTERNOON, *October 16, 1884.*

Board called to order at two, P. M., by Doctor G. W. Atherton, Vice President, in the chair. On motion of Mr. REEDER, of Bucks, the subject of legislation to protect the dairymen against the manufacture and sale of imitation butter and cheese was taken up, and W. P. Richardson, President of the Orange County (New York) Milk Association, was invited to address the Board. After a full discussion of the topic in all of its bearings by Messrs. DAVIS, REEDER, RICHARDSON, BEEBE, LEFFMANN, ATHERTON, Doctor EDGE, and SECRETARY, Doctor EDGE offered the following:

Resolved, That the Committee on Dairy and Dairy Products be instructed to prepare, from the material available to them, a draft of an act of Assembly that shall have for its object the protection of the dairy interests of the State from any damaging effects of the manufacture and sale of imitation products, and after a careful revision of the same by the chairman of the Committee on Legislation of this Board, with a view to its constitutionality, the committee are hereby directed to have the said proposed act presented to the Legislature at an early period of the next session.

After partial discussion, Doctor LEFFMANN offered the following amendment: Insert after the word "products," in the fiifth line, "Under the claim, title, or pretense of being genuine." A vote on the amendment being called for, it was lost. The vote recurring upon the original motion of Doctor Edge, it was declared carried.

On motion of Mr. REEDER, the vote was reconsidered, and, after discussion, the original motion, as amended by Doctor Leffmann, announced as carried, and the Secretary directed to furnish the chairman of the dairy committee with a copy of the amended resolution.

Doctor J. P. Edge here took the chair, Doctor Atherton having been excused.

On motion of the SECRETARY, Doctor J. W. MADERA addressed the Board upon the subject of "The American Horse and His Breeding."

By request, Doctor E. HARVEY, member from Delaware, addressed the Board upon "Psychology," which was listened to with much interest and which elicited a number of questions which were answered by Doctor Harvey.

On motion of Mr. SMITH, seconded by Mr. SCOTT, Mr. UNDERWOOD, of Wayne, read an essay on "Natives, Grades, and Thoroughbreds for the Average Farmer," which called forth discussion from Messrs. Doctor HARVEY, DAVIS, SMITH, Doctor EDGE, and SECRETARY.

J. P. BARNES offered the following, which was unanimously adopted:

WHEREAS, The Pennsylvania Board of Agriculture, having, in response to the invitation of Hon. Joseph Noble, met at Bedford, October 15th and 16th, deems it proper to give formal expression to its gratification at the kind reception that has been extended; therefore,

Resolved, That the Board tenders its cordial thanks to the citizens of

Bedford for their hospitality and kind interest manifested by their presence and active part taken in the meetings of the Board, and particularly to the Hon. Joseph Noble and to Colonel William Hartley for the care which they have taken in arranging for the comfort and convenience of our members and affording special opportunities for examining the interesting features of note in this locality; and, also,

Resolved, That the thanks of the Board are tendered to the Judge and County Commissioners for their kindness in affording the Board the free use of the county court-house.

On motion of Mr. ENGLE, adjourned until 7, P. M.

THURSDAY EVENING, *October 16, 1884*

Board called to order at seven, P. M., by Emery Davis in the chair.

Doctor J. P. EDGE offered the following, which, after discussion, were adopted and referred to the Secretary for further action:

"WHEREAS, The agricultural population of the United States comprises seven twelfths of the entire people, and on the result of their industry the subsistence of the Nation depends;

And whereas, It appears that in the present organization of the national government, both in the executive and legislative departments, this great industry is practically without representation or influence in the shaping of legislation and administering the laws; therefore,

Resolved, As the sentiments of this Board, claiming to represent the interests of farming in this State, divested of all political bearing, that the demands of the time require that farmers should take a more active part in the choice of members of all representative bodies that have control of the enactment or enforcement of laws, to the end that their rights and business interests shall be respected and recognized in the legislation of the future.

Resolved further, That Congress should, at the earliest possible period, provide that the meteorological and other observations carried on by the United States signal service should be so extended and applied as to put every agricultural community in the country in possession of timely knowledge, by signals, of coming changes that may effect their crops.

Resolved further, That the immense volume and perishable nature of the products of the farm and garden demand that the general government shall so enact as to protect the producer from the effects of monopolies and pools on the part of the carrying companies so as to insure a prompt and cheap medium for the transfer of commodities to the markets of the world.

And resolved, That the Secretary of the Board be instructed to furnish a certified copy of these resolutions to our senators and members and to each of the public journals of the State with which his office is in correspondence."

On motion of Mr. ENGLE, Doctor H. LEFFMANN, microscopist of the Board, then delivered an address upon "Microscopic Life as a Cause of Disease in Animals and Plants," which was listened to by a large audience and which was illustrated by a large number of camera plates.

By special request, J. SIMPSON AFRICA, Secretary of Internal Affairs and *ex-officio* a member of the Board, read an essay on "The Settlement of the Southern Border Counties by the Scotch-Irish."

On motion, adjourned to meet at Harrisburg at the usual time for the annual meeting.

EXTRACTS

FROM THE

EIGHTH ANNJAL REPORT OF THE SECRETARY OF THE BOARD.

FARM WAGES AND BOARD OF FARM HANDS.

In the collection of statistics in relation to the wages of workmen employed on farms, we have recognized eight forms of bargains, but our returns from our correspondents and the letters which have accompanied them, show conclusively that these by no means cover all of the variations in bargain and terms which exist. From these reports, it is evident that the scarcity of reliable farm laborers is forcing our landowners to adopt the share system and that each spring causes an increase in the number of farms worked in this way.

The eight classes, as we have recognized them, are as follows:

1. Men hired for the whole year by the month, with constant work and pay, whether wet or dry, and boarded by the employer.
2. Men hired for the summer or working months (usually six to eight) and furnished with work and pay, whether wet or dry, and board.
3. Men employed during the whole year, but only furnished work in weather fit to work out doors and paid at a fixed rate per day, with board when at work.
4. Men employed on the same terms as No. 3, except that they board themselves all the year whether at work or not.
5. Men employed for the whole year in the same manner as No. 1, but boarding themselves.
6. Men employed the same as No. 2, except that they at all times board themselves.
7. Men employed by the day, for such work and time as may suit the employer, but with no guarantee as to the amount of work to be furnished, and to be boarded by the employer when at work.
8. Men employed for special work in harvest as wanted, and boarded by the employer in all cases when at work.

Our reports indicate that upon nearly all farms one or two men are employed upon the terms indicated as No. 1. In dairy districts it is usual to employ more men on this system than in districts devoted more exclusively to stock-feeding and growing. Upon every farm there is, necessarily, a certain class of work which is done out of regular work hours and the terms of the bargain are usually more or less dependent upon the nature and extent of this extra work. In dairy districts, the milking is usually done before sunrise and after sunset and this class of labor is best suited to the needs of the case.

Our returns (see table) indicate that the wages of this kind of labor vary from $11 20 in Perry to $20 25 in Philadelphia, and that the average may

be found in Allegheny, Cameron, Chester, Lackawanna, Lycoming, Northumberland, Susquehanna, Warren, Wayne, and Wyoming. As a rule, wherever this form of labor has to compete with the lumber or mining interest it averages high, and we also find it high near our larger cities where so many forms of labor compete with it. Near Philadelphia and Pittsburgh (and the same will apply with equal force near any large city) the figures as given in our table do not fairly represent the increased rate, for in all cases they are accompanied by a decrease in the number of hours worked per day

The following table will exhibit the variations in the rate of wages for this class of labor:

	Lowest.	*Highest.*	*Average.*
1877,	$8 33	$18 00	$13 25
1878,	8 50	15 00	11 25
1879,	8 00	14 50	10 75
1880,	8 75	19 75	12 00
1881,	10 50	16 00	13 25
1882,	9 50	19 50	13 70
1883,	9 75	19 75	14 00
1884,	11 50	20 25	14 25
Average,	$9 35	$16 59	$12 80

By the second plan on our list, men are usually hired for a term of from six to eight months or during the working season. This mode is usually confined to the extra help needed during the season of putting in and harvesting the crops.

Inasmuch as the laborer is either idle or must take such work as he can get during the leisure months, he expects, and usually receives, more in propertion than his companion who has constant work during the whole year. Just how much difference should be made on this account is a constant theme of dispute, and has done much to bring the plan into disfavor. We find that in our eastern and more thickly-settled counties this mode is the most common, and, so far as the extra labor is concerned, seems to give satisfaction to both parties. While the first-named plan is mostly adopted with men having no families, the one now under consideration best suits the needs of men with families who reside near by and who usually have gardens of their own in which they work during odd times.

By reference to our reports, we find the variations of this plan to have been as follows:

	Lowest.	*Highest.*	*Average.*
1877,	$12 00	$20 00	$16 25
1878,	12 00	18 50	15 25
1879,	11 00	16 75	14 50
1880,	11 75	21 50	16 75
1881,	11 50	21 00	16 75
1882,	12 00	22 50	17 25
1883,	12 25	22 25	17 00
1884,	14 25	29 50	21 00
Average,	$12 75	$21 65	$16 87

The next two plans are, probably, but variations of the other two, in which the man is hired by the day instead of by the month, and does not work or remain on the farm Sundays. Like the former one, this plan is often preferred by men who have families, and who, for reasons similar to those given above, do not wish to work constantly. The sixth plan is also a variation of the other four, except that it is far less common; it is applicable to cases in which it is not convenient for the employer to board his men.

The seventh plan is more or less common in all portions of the State, and is the main reliance of the farmer for extra help, such as threshing, wood-cutting, and the extra labor which accompanies seeding. Our table shows the following variations in the wages paid under this plan:

	Lowest.	*Highest.*	*Average.*
1881,	$ 75	$1 00	$ 87
1882,	70	1 15	87
1883,	80	1 15	87
1884,	75	1 20	90
Average,	$ 75	$1 12	$ 87

The eighth class on our list takes in that class of extra help employed especially for harvest, and the compensation varies very little in the same neighborhood, for, unjust as it may seem, very little, if any, variation is made in favor of good hands or against poor ones, the only perceptible difference, apparently, being that, if there is a surplus, the latter find some difficulty in procuring work. During the past four years, the variation of this class of labor has been as follows:

	Lowest.	*Highest.*	*Average.*
1881,	$1 20	$2 00	$1 50
1882,	1 25	2 00	1 60
1883,	1 35	2 20	1 75
1884,	1 25	2 00	1 65
Average,	$1 25	$2 05	$1 62

Our reports indicate that there is an increasing tendency, on the part of the employer, to so arrange the bargain that at least a portion of the farm hands shall provide their own board, and quite a number of our official correspondents report that until they received our annual circulars and made the calculations demanded by a careful answer, they had no idea that it cost so much to board workmen even on the farm where everything is supposed to be cheap and plenty; and after the publication of our reports our readers have frequently written us that they regarded the estimates too high; inasmuch as we have over four hundred correspondents who are all furnished with the same data upon which to base their calculations, we do not think them too high, and, from our own experience, would increase rather than decrease them. In many cases, those who make the estimate do not place a sufficient estimate or value upon the item of convenience and saving to the female members of the family. Where this is done, we invariably find a desire to have the men board themselves; the main argument against it is that there is too much time lost at meals, but this, like many other items, depends very much on the bargain and the men themselves. So far as it has been tested, the practice of putting the farm "out to the shares" seems to offer the best solution to the board difficulty, and we find that the number who follow this plan are on the increase, and that, in many cases, it is forced upon the owner on account of the difficulty of procuring satisfactory labor at any price or on any terms, it being found in practice that the best men are usually to be found working for a share of the crop.

COUNTY AGRICULTURAL SOCIETIES.

In compliance with the custom of the past seven years, the Board has prepared and issued a complete list of the county agricultural societies of the State, with the time at which the autumn fair of each would be held. To this was this year added a full list of the names and addresses of the leading officers of each society. The labor of sending out the proper blanks to secure this information added materially to the duties of the Secretary

at a time when the work of the office had reached its maximum, but we feel that this has been amply repaid by the evident appreciation of our efforts by the agricultural societies themselves, and also by the manufacturers of agricultural implements, fertilizers, and farm supplies, and there can be little room to doubt that these lists contributed, both directly and indirectly, to the success of the fall exhibitions, by calling the attention of those most interested to the fair, and in many cases furnishing the exhibitor with information in an official form, which enabled him to arrange for the exhibition of his goods in a regular circuit. The number issued failed to supply the demand, and the Board was requested to furnish a fourth edition, but it was not deemed expedient to do so. When first issued, soon after the Board was organized, the plan was new, and a few hundred supplied the demand of our exhibitors, but this has since increased until a third edition fails to furnish the requisite supply.

We have in the State ninety-five active agricultural societies, all of which either hold annual fairs or meetings for the discussion of topics connected with agriculture. In addition to these we have more than one hundred farmers' clubs, which meet at the houses of the members or at stated places, regularly, for discussion. A number also combine the two plans, and, without giving up the regular monthly meetings for discussion, also hold an annual fair for the exhibition of farm product, and machinery. The Secretary of the Board is in correspondence with the officers of nearly all of these societies, and, as far as practicable, they have been made a means of communication with the farmers of the State. In addition to these organizations, we have within the State at least six hundred and fifty granges of the Patrons of Husbandry, which, while they have displaced very many of our farm clubs, have well taken their places, and, to the facilities for practical discussion, have added the means of making purchases of all kinds of farm supplies at rates which make the membership an object from a pecuniary point of view and at the same time afford all of the advantages of farm clubs as they formerly existed. These organizations afford one of the most reliable and best means of direct communication with the class which this Department is designed to benefit, and it is to be regretted that our means of furnishing this information is so limited. If one of the annual reports of the Board could be placed in the library of each of these granges, they would directly reach a much larger number of farmers than is possible by the present mode of distribution, and would bring the work of the Board directly into the hands of those most likely to be benefited by it. So far as our limited resources will permit, the libraries of these organizations are given the preference, but, in the absence of a list of the officers, we find ourselves hampered in the work of distribution.

Data collected by the Board enable us to make the following estimate of the mode of organization, financial condition, and of the county agricultural societies of our State:

Total number of active county societies,	95
Total value of real estate owned by county societies,	$575,000 00
Total amount of premiums paid at autumn fairs,	95,000 00
Total cost of autumn fairs of 1884,	175,000 00
Total amount of bounties paid by county treasurers,	4,000 00
Number occupying grounds owned by the society,	60
Number occupying grounds leased for fair purposes,	27
Number holding meetings for discussion but no fairs,	8
Number conducted on the mutual plan, all ticket-holders being members,	38
Number conducted on a stock basis, shares being sold,	49
Total average attendance at fall fairs of 1884,	850,000

The attention of the Board has repeatedly been called to the present unsatisfactory financial condition of many of our county agricultural societies, and several applications have been made for a revision of the act granting bounties from the county treasuries to the societies. It is claimed that this act, as it stands upon the statute books, is unfair and unjust in its application, and it is also charged that the construction placed upon it by some of the boards of county commissioners renders the act still more obnoxious. In a few of the counties (notably Green and Columbia) special acts have been procured which prevent the application of the State act to the societies of these counties. This act (P. L. 1851, page 290) is, so far as it applies to county societies, as follows:

"SECTION 4. That when any number of individuals shall organize themselves into an agricultural or horticultural society, or any agricultural or horticultural society now organized within any county of this Commonwealth shall have adopted a constitution and by-laws for their government, elected officers, and raised, by voluntary contribution of its members, any sum of money which shall have been actually paid into their treasury, and that fact be attested by the affidavit of their president and treasurer, filed with the commissioners of the county, the said county society shall be entitled to receive annually a like sum from the treasurer of the said county; *Provided*, That said annual payment out of the county funds shall not exceed one hundred dollars; *And provided further*, That but one such society in any one county shall be entitled to receive such appropriation in any one year under this act."

Our official reports show that forty-two county societies have produced such evidence as has caused the commissioners of their respective counties to admit their right to this annual bounty, while the remaining forty-five societies, although from every point of view, except the indirect wording of the act as justly entitled to it, are deprived of its benefits. This state of affairs has caused repeated appeals to the Board for such changes in the act of 1851 as will make it more equal in its application. Our correspondence proves that this wide-spread dissatisfaction arises, not so much from the failure to secure the amount of the bounty, as it does from the ill-will which is engendered in counties having more than one society and where the words of the act compel the county commissioners to give the bounty to one society to the exclusion of the others. In several counties the commissioners pay the bounty to the different societies alternately, and in others, the annual dispute which occurs materially retards the satisfactory progress of all of the societies and gives rise to local rivalry which, in several of our counties, is, to a large extent, responsible for the present financial condition of these organizations. Armstrong, Crawford, and Washington have each four county organizations within their limits, and the question of the county bounty is one which annually gives rise to unpleasant feelings, and, in several cases, has ended in vexatious and expensive law suits. The same argument applies, with nearly equal force, in the counties of Berks, Bradford, Chester, Clinton, Dauphin, Erie, Juniata, Lycoming, Mercer, Montour, Northampton, Schuylkill, Susquehanna, Tioga, and Wyoming, each of which has more than one society.

So far as the records of the Board are concerned, there seems to be no evidence to prove that the fifty-three societies which receive no bounty are not as justly entitled to it as the forty-two which now receive it.

In addition to the difficulty and inconvenience existing in the counties, the Board of Agriculture is often compelled to assume an unpleasant position with reference to some of the county societies. Of our membership of fifty-two, forty-two are elected by county agricultural societies, "entitled

PRICES OF WHEAT AND FLOUR IN PHILADELPHIA.
From Dec. 1st. 1883. to Dec. 1st. 1884.

by existing laws to receive an annual bounty from the county." In several cases, the societies, claiming that they are entitled to a bounty, have elected members of the Board, who, upon the presentation of their credentials at our meeting, have been refused the seat which they claimed, thus, in some cases, engendering a local feeling against the Board when the act of Assembly, and not our organization, was at fault. In some of the Eastern States, the question of bounty to these organizations assumed such a position that the acts relating thereto were repealed and the bounty paid directly from the State treasury, thus relieving the county officials of an unpleasant task, and placing the whole question under a ruling which avoided much of the difficulty by a universal application to all portions of the State and to all societies alike.

THE EFFECT OF FORESTS UPON RAINFALL.

It is quite common to hear our older and middle-aged neighbors assert, with considerable force and seeming certainty, that our present annual rainfall is not so great as when they were boys. That streams, which were known to them as boys, are now nearly or quite dried up. That certain noted springs have failed very much in volume or have disappeared entirely. That well-known water powers have been seriously decreased or have been abandoned as nearly useless or of little value. All of these and other similar reasons are advanced to prove that, owing to the destruction of our forests, our annual rain-fall has diminished.

And yet, in spite of these facts, (for they are facts,) the writer fails, after no small amount of effort, extending over much of the time which has elapsed since the formation of our Board, to obtain any reliable data to prove that there has been any material decrease in our annual rain-fall. It is true that we are more liable to periods of drought than formerly, but, upon the other hand, we find that these periods have been counter-balanced by others of increased or more than usual rain-fall; so that our records seem to prove that our average supply of rain is about the same as it was forty or fifty years ago, or as far back as our records extend.

Admitting these facts, as they are presented by those who claim that there has been a change in our annual supply of rain, we must explain or account for them upon some other hypothesis. Our correspondence and observation lead us to think that they can be much more satisfactorily accounted for on the theory of an unequal distribution of the same amount of rain-fall, and that the same causes which have produced this unequal distribution will continue to exert their influence until (unless prevented by a change in our present system of forest destruction) our seasons will be divided into two portions, which may be termed wet and dry, and which will take rank as such in the same manner as similar changes have been noted in other countries.

Exactly how this change in the distribution of our rain-fall is produced, or how it is to be remedied, is by no means so clear or so easily explained. We however think it safe to assume that quite as much water passes down our streams, or ravines which were once streams, as formerly, and that if we could devise some plan by which we could retain the rain-fall and guard against evaporation, so as to supply the surplus to the streams in continuous and regular amounts, our decreased springs and weakened water powers would become as effective as at any former time, and that the whole problem of our water supply would be solved.

In past years our forests, by their shade and porous open soil, accomplished this purpose, and, by retaining the surplus, gave it out by sundry springs to the streams in a regular and not too rapid supplies. In former years our

forests, by their shade, prevented a too rapid evaporation from the surface, and thus prevented another present draft upon the source of supply. Formerly, the forests, by the shade and shelter afforded by their trunks, retained the snow for a much longer period than now. Formerly, the soil of the forest was always moist and open, permitting of the rapid absorption of the rain; now this same soil is generally hard and dry, and, instead of absorbing the water, permits it to rush off into the streams in torrents.

Formerly, our woodlands had no "washes" and "gullies," where they now exists as a hindrance and an eyesore.

As a natural consequence of this combination of circumstances and causes, we now find that the rafting season on the Susquehanna and its tributaries is not only much more uncertain than formerly, but that it is practically reduced to a period scarcely sufficient to convey the timber to tide-water, when formerly it extended over a period of several months. The water which annually passes down the river is probably as great as it was at any period of which we have a record, but its distribution is much more irregular and uncertain in the amount and continuation of its flow.

The reports of our Committee on Forest and Forestry, and the correspondence of the Board, clearly demonstrate that the people of our State are alive to the importance of the problem and of the magnitude of the threatened evil. The annual messages of our two preceding Governors, and the well-known interest of our present Executive officer, prove that all which is now needed is the proposition of some practical remedy; this once proposed, and its practicability demonstrated the remedy may be applied: but it is just here, in the most important place, that we are weak. Thus far no practical plan has been offered; of theory, we have plenty and to spare, but, as His Excellency Governor Hartranft once told you, "No one offers anything practical" for our adoption.

As a first and primary step, let our Legislature, at its next session, authorize the Governor to appoint a commission of not less five, whose duty it shall be to carefully investigate the whole matter, ascertain what other States and other countries have done; let them, by personal examination and by correspondence, ascertain the views and wants of the people in a matter of so much importance to their general welfare, and let this commission present a carefully digested report to the Governor and to the Legislature, and thus furnish us with some reliable information on which to build the structure. This commission should receive no remuneration beyond the actual and necessary expenses, and these should be limited to a reasonable amount, in the expenditure of which they should be held strictly accountable.

The report of our committee and the general correspondence of the Board plainly indicate that no single agent does more to retard forest growth than forest fires, and that, in any plan for the re-timbering of our State, these fires are the worst foe which we will have to meet and conquer. In fact, if it were not for this destruction the problem would hardly be forced upon us for solution.

In the mountainous portions of our State, there are large areas which, for many years to come, will prove useless and unprofitable for any other purpose except the growth of timber. If these areas (many of them but recently cleared) were allowed to grow up with their natural timber, and this natural growth protected from forest fires, we could soon replace the waste, and, at the same time, afford the owner a good rate of interest upon his investment. Many of the owners of these tracts fully appreciate the force of the argument from a "dollars and cents" point of view, and have tried to protect themselves, but, in many cases, only to see a forest fire

sweep off, in a few hours, the work of as many years. The results of these private attempts clearly prove that this solution of the problem is practical, and that, with the assistance of other and larger surrounding land owners and the help of the State, much might be accomplished in this direction.

This protection from fire is, of course, needed in the more thinly settled portions of the State, and for other portions, other plans may be adopted. Our correspondence demonstrates that the establishment of a fixed day on which trees shall be planted, and often known as "Arbor Day," has been productive of much good in other States, and that the number of trees thus planted has been quite large. If it works well in Kansas, Nebraska, and Iowa, why not in Pennsylvania? And why may not our own State have her "Arbor Day," too? It may be that our annual gain in this way will not be large, but it is a move in the proper direction and can do no harm. It is a matter of regret that our only attempt at legislation of this kind is not only of a negative character, but, worse still, of an injurious character, and it is a matter of congratulation that it has produced positively no effect.

And now, having admitted the existence of the evils resulting from the destruction of our forests, let us cease to theorize and temporize. Our Legislature is willing, and many of them will be anxious to act, and action has thus long been deferred because the matter has not been sufficiently examined and reported upon by competent persons. A commission will, at least, be one step in advance, and may possibly lead to other and more important ones; then let us do the best that we know, and trust to the future to provide the way and means. The trouble with us in this, as in many other things, we want to do too much at once, and are not willing to take short steps until we learn how to walk faster. Every step in the proper direction will count.

Thomas Meehan, Botanist of the Board, and justly noted for his examination of the forest area of our State, writes thus in relation to the question of "Practical Forestry:"

"The great difficulty in dealing with the question of forestry in Pennsylvania comes from the difficulty of obtaining exact knowledge. A large amount of what is presented to us as fact—even by those whose business it is to deal in fact, that is, men of science—is simply guess-work.

The forest question is a mixed one. It is important that we should have a perpetual supply of lumber, and equally important that our streams should have a regular supply of water. Are we in danger of a short supply of either, and have the two questions any relation to each other? If we be in danger, what can we do to avert it?

In regard to the forest area of our State, figures collected by the Board and published in its meetings show that one fourth of the area of the State is still under forest. A large proportion of this, however, is second growth, coming up so thickly together as to starve each other, and containing a great amount of dead under-trunk from the first growth which will sooner or later give it over to a forest fire. We can expect little in the way of a future timber supply from these forests.

If, however, there is any relation between the rain-fall or the quantity of water in our streams, these forests ought to be as useful as though they were in the best condition for future lumber supplies.

There is no evidence, which science would regard as conclusive, that there is any material relation between forests and the rain-fall. The figures in various States, figures kept regularly for many years, show the same average rain-fall in States, now comparatively destitute of trees, as when nearly the whole area was unbroken forest. Many of those who once were under the impression that there was a closer relation have abandoned this ground

since the figures have left them no alternative. These, however, still believe—at least many of them—that forests hold the snow together and keep it from melting rapidly, thus aiding it, as it gradually melts, to run into the ground instead of going at once to the streams when melting rapidly. This *may* be, but is it the fact? There is no doubt springs sometimes weaken—sometimes disappear—and that the volume of water sometimes lessens in streams as the years roll by. But is this from geological causes, or has forestry any relation to these changes? The figures certainly show changes. In 1816, the maximum flow of the Schuylkill at Fairmount was five hundred million gallons. It gradually decreased till, in 1874, it was "less than half this amount," (report of Water Department, Philadelphia, 1884, page 2.) No figures are given relative to the maximum flow. The rain-fall being the same, the volume averaging the whole year should be the same. If the maximum be greater than in 1816, it would seem that, from some cause or other, the water passed away earlier than in former times, and it might be worth while to ascertain positively whether a decrease in forest area has had anything to do with this change.

Awaiting the positive solution of this question, the future lumber supply is one on which no shadow of doubt casts itself. It is a question worthy of our best thought. At the outset of its consideration, we may remember that, for lumber purposes, a tree is in its prime at one hundred years. At two hundred years old, a tree is generally in a rapid decline, and the timber of little account. From the lumber stand-point, then, there is no gain in any scheme for the *preservation of old forests.* In fact, the immense amount of dead material they contain render them *mere fire-traps.* They feed the terrible forest fires, in which hundreds of thousands of dollars' worth of property are annually destroyed. No attempt should be made to preserve them. The sooner they utterly disappear, the better for the State. Our effort should be in the direction of encouragement to young forests to take the place of the decaying and dangerous older ones. Wise legislation could do much to aid this effort. Most suggestions of the past have been born of wild hypotheses, or led on by those who had little comprehension of the road to success. Tree-planting, tree-raising, general forestry management, is a business requiring knowledge, judgment, and skill that cannot be learned in a few months, and by the study of books or papers.

The great weakness of all forestry laws, both State and national, has hitherto been that no inducement has been offered to forestry as a business, but to individuals who know absolutely nothing of trees. Millions of dollars have been lost by the futile attempts of ignorant persons, and where success has followed plantings the trees are of no value to the lumber interest, from the kinds selected, or are in such small lots or parcels that outside of mere fire-wood or very local uses they are of no industrial consequence.

It should be made the interest of bodies of capitalists to care for the younger forests coming on in a proper business way. Where thick, they should be thinned out. Underbrush should be cleared out, and everything that would feed a forest fire destroyed. Such a cared-for forest would make trees, in twenty-five years, as good as in fifty years by the present neglected plan, besides absolute security from forest fire.

It would be extremely profitable to care for a forest in this way, but the owners should in some way be compensated as they go along. Few men care to wait even twenty-five years for a fortune, and the same may be said of forest-planting. Plots of hundreds, or even thousands, of acres should be taken up and planted by incorporated bodies, and the terms made so that immediate profits would result. It requires no remarkable wisdom to frame legislation that should accomplish this end—it simply requires that practical foresters, capitalists, and good legal talent should consult with one another in framing the scheme. No one of these classes can accomplish anything useful—together, the matter is simple enough.

DISEASES OF LIVE STOCK.

We have to report more than the usual amount of disease among live stock, and the services of our veterinary surgeon have been called into requisition to a greater extent during the year which has just closed than at any time since the organization of our Board. In the counties of Centre, Lancaster, Cumberland, Berks, Adams, and York, cases of spleenic apoplexy (anthrax fever) have been reported, and most of the cases were visited by either the surgeon or the Secretary. In all cases, the disease seemed to be clearly traceable to one or both of two causes, viz: impure drinking water, or low, swampy pastures producing innutritious grasses. In two cases, the only water to which the stock had access was that contained in stagnant pools exposed to the direct rays of the sun and swarming with the germs of disease; in both cases, a number of animals were lost before the assistance of the Board was asked, but in both cases the advice given prevented any further loss. We could scarcely construct a better vehicle for causing or propagating this disease than the water of these surface pools; the disease having once been started, the first diseased animals introduce into the pond the germs of the disease, and the condition of the water and the surroundings are such as to soon fill the water with germs, which the well animals must take into their systems. It is not so much a matter for surprise that a number die, but it seems surprising that any of the herd escape, and the fact that they do escape the disease proves that nature has the power of throwing off germs without any apparent effect on the system of the patient. This disease usually manifests itself during the last three weeks in August or the first two in September, and ceases as soon as we have cool nights with frost. In our more thickly settled counties we seldom find the disease except at these dates, but in some of the mountain counties we find it during May and the early part of June. We have a disease known as "Wood evil," which is so similar in its causes and effects as to warrant the same name. The causes are identical; the animals are turned into the woodland to obtain such food as they can; the short crop of grass is innutritious, and the animal is often compelled to subsist upon the young leaves and branches, which are still worse. From this kind of food the vitality of the animal is very much lowered and disease sets in, but does not take so rapid a form as later in the season. As a case of this kind was reported in Centre county and several animals were sacrificed before notifying the Board, the stock were removed to the yard and fed upon good hay and grain and no more losses occurred.

In two cases, it was found that the local surgeon was administering cathartics and in one case had resorted to bleeding, thus in both cases practically assisting the disease in its progress, by weakening the patient at a time and with a disease in which all strength is needed for recovery. In any case, no matter what the origin, the only remedy is to furnish pure water and remove the animals to high ground and nutritious pastures; the liberal use of tonics will assist nature to throw off the germs of the disease, the formation of which is sometimes so rapid that the animal appears to be well in the evening and will be found dead in the morning. In nearly all cases, young and growing stock, in good condition, are the first in the herd to show the effect of the disease.

One of our best authorities gives the following symptoms of this disease: "The patient ceases feeding and ruminating, or does so irregularly, has partial sweats, staring coat, varying heat of the body, arched back, quarters rested on the stall or fence, or lies with head turned to the flanks. A high temperature (105 to 107 degrees) precedes the outward symptoms by hours or days. The eye is sunken, dull, watery, with the shades of brown and yellow, and dark spots remarked in the horse; breathing hurried, heart's action violent, pulse weak, loins and back tender and even crepitating, urine bloody, bloody liquids escape from the nose, anus, and eyes, and the dung is streaked with blood. As the disease advances, the temperature of the body decreases, and the patient dies in convulsions or quietude or makes rapid recovery. The fatal results usually take place in from twelve to twenty-four hours."

From the counties of Adams, Berks, Bucks, Cumberland, Montgomery and Lancaster cases of hog cholera have been reported, and some of the cases were visited and carefully investigated by our surgeon. We regret to have to report (as last year) that we have thus far no reliable remedy or cure to offer, and where visits are made can only recommend means of prevention rather than cure. The prompt separation of the sick from the well is of the greatest importance in preventing the spread of the disease. All carcases should be buried deeply and well covered with lime. Disinfectants should be freely used at all points to which the diseased animals have access. Some of the western feeders claim that partially charred corn (not shelled) will check the disease, and all agree that charred vegetable matter in any form is a valuable adjunct in preventing infection. One of our correspondents claims good effect from administering a solution of copperas in water twice or three times each week—the dose named is a half teaspoonful in three quarts of water or swill to each full-grown animal. This disease is highly infectious, and it is asserted, on the authority of Professor Law, that it will carry in the air for the distance of half a mile. The National Department of Agriculture has, for several years past, directed its attention to the investigation of the disease but is not prepared to offer any remedy. Professor Law thus describes the symptoms and appearance of the disease: "Incubation varies from a week to a fortnight in cold weather to three days in warm. It is followed by shivering, dullness, prostration, hiding under the litter, unwillingness to rise, hot, dry snout, sunken eyes, unsteady gait behind, impaired or lost appetite, ardent thirst, increased temperature (103 to 105 degrees) and pulse. With the occurrence of heat and soreness of the skin, it is suffused with red patches and black spots, the former disappearing on pressure, and the latter not. The tongue is thickly furred, the pulse small, weak, and rapid, the breathing accelerated, and a hard, dry cough is frequent. Sickness and vomiting may be present; the animal grunts or screams if the belly is handled; the bowels may be costive throughout, but more commonly they become relaxed about the third day and an exhausting, fœtid diarrhœa ensues. Lymph and blood may pass with the dung. Before death the patient loses control of the hind legs, and is often sunk in complete stupor with muscular trembling and involuntary motions of the bowels."

As treatment, the same authority gives the following: "Feed well-boiled gruel of barley, or rye, or, in case these raise the fever, corn-starch made with boiling water; give to drink fresh, cool water, slightly acidulated with sulphuric acid. For the early constipation give mild laxatives (caster-oil, rhubarb,) and injections of warm water, following up with fever medicine (nitrate of potassa and bi-sulphite of soda). If the patient survives the first few days and shows signs of ulceration of the bowels,

(bloody dung and tender belly,) give oil of turpentine—fifteen to twenty drops night and morning. Follow up with tonics and careful, soft feeding."

The attention of the Secretary has also been called to a number of cases of glanders among horses and mules, but, as we have no State law relating to this disease, no action could be taken. I would call your attention to the propriety of Pennsylvania imitating the example of some of the other States—in protecting farm stock against the criminal negligence of the owners of diseased animals. I would also ask your attention to the advice given by Professor Huidekoper, of the University of Pennsylvania, at our last annual meeting. Under the common law, the stock-owner has no protection against this disease; it is true, that if he can prove a knowledge of the nature of the disease, accompanied by carelessness upon the part of the owner, he can recover damages, but this remedy only takes effect after stock are infected, and it is, perhaps, too late.

In April last, a disease exhibiting contagious symptoms appeared among the stock of Mr. Vance, near Burgettstown, Washington county, and was pronounced by the local authorities to be contagious pleuro-pneumonia; the outbreak was heralded far and wide, and much damage threatened to one of the best stock-growing districts of the State. Orders already given were countermanded and others withheld. Unwilling that such an interest should suffer without some firm foundation, His Excellency the Governor ordered an investigation, and the surgeon of the Board was sent to the infected herd. After such examination as was possible under the circumstances, Dr. Bridge pronounced it an aggravated case of bronchitis. All the animals in the herd having been exposed to the same cause of disease, one after another were affected, and it is not to be wondered at that the disease was pronounced to be contagious, and it evidently being an affection of the lungs, it was natural to call it pleuro-pneumonia. Nearly every season we have similar cases reported, and since the attempt to eradicate lung plague was commenced, such cases are oftener noticed. Stock usually kept in warm or close stables are turned out during a few hours of a very cold day or during a driving storm; the sudden change of temperature causes an irritation of the lungs, which, being still further aggravated by the necessary use of these organs, soon attain a dangerous stage, and unless help is at once afforded death follows. In this case, a number of animals were lost; but, as the trouble was local, there was no spread of the disease beyond the original herd. In several cases, outbreaks of this kind have been confounded with those of contagious pleuro-pneumonia or lung plague, and thus the theory has originated that the latter may originate in improper treatment, and, having thus started, becomes contagious. In all such cases, careful investigation will show that the so-called contagious symptoms are due solely to the fact that all of the animals attacked have been exposed to the same disease-producing cause. An animal thus affected cannot communicate the disease to another.

We have also been called upon to investigate "husk" or "hoose," (verminous bronchitis,) but this trouble has not been as common as in past years. As a rule, wet seasons are marked by its more frequent occurrence, and it is oftenest noted on low, wet pastures. It is contagious in the fullest sense of the term, and is caused by a minute microscopic worm (*strongylus filaria*) which finds lodgment, first in the larger tubes of the lungs and in the windpipe, but, as they rapidly increase in numbers, soon pass into the smaller air ducts, causing great irritation and constant

coughing. As they are dislodged and fall into the drinking water or on the grass or provender, they are soon spread through the whole herd. They are seldom dangerous to full-grown or healthy stock, but instances have come under our notice where full-grown animals were seriously affected, and, had not remedies been promptly applied, would undoubtedly have been lost. If fairly established among stock, and allowed to obtain a strong hold before anything is done, it is usually fatal with young animals. The fact that the disease cannot be reached by ordinary medicines makes it a very difficult one to control. As soon as observed, the affected animals should be fastened in a close stable or out-building and thoroughly fumigated with the fumes of burning sulphur. Nothing short of complete and thorough fumigation will kill or dislodge the worms, and nothing short of their dislodgment or death will relieve the stock. All crevices should be closed, and the operator must not be alarmed by the coughing which ensues; he should remain with the stock, and can readily tell what they can endure without injury. Two or three such applications will produce marked results, and, except in very bad and long-neglected cases, will cure the disease. It is usually confined to calves and young cattle; but, in one case brought to our notice, colts were quite as badly affected.

ROAD LAWS.

The correspondence of the Board, the discussions at our sessions in different parts of the State, the reports and resolutions of granges and farm clubs sent to the meetings of the Board, and the discussions and proceedings of these clubs, all clearly prove that there is a general and growing desire for some modification of our existing general road laws. The necessity for this change seems to be most evident in those of our thickly settled counties which are still working under the general law of 1834. In several of these counties, (previous to the passage of the new Constitution,) special laws were obtained which have removed the evils complained of and have given provisions which are apparently satisfactory to the people, or, at least, we have no complaints from these counties, of difficulties under either local or general acts.

Since the passage of the act of April 15, 1834, great changes have taken place in the needs of the public in relation to public travel, and these changes are greatest in our more populous counties. The invention and introduction of improved labor-saving machinery, by which horse-power is largely substituted for manual labor, has (at least in some parts of our State) completely revolutionized the manner of mending and repairing the roads in the most economical manner. Now this machinery, by the work of two men and one or two pairs of horses, may do an amount of road work which, in 1834, required the united work of twenty-five men for the same time.

As the act of 1834 places impediments in the way of the adoption of this improved method, it is not surprising that a desire exists for its repeal or modification, and the introduction of new features which, though they may not positively encourage the introduction of machinery, will, at least, not make it impracticable or impossible in such counties as may desire it. These difficulties arise almost entirely from the provisions of the 34th section of the act of April 15, 1834, (P. L. 516,) which provides as follows: "That before issuing the duplicate and warrant for the collection of road taxes, it shall be the duty of the supervisors of every township to give notice to all persons rated for such taxes, by advertisement or otherwise, to attend, at such times and places as such supervisors may direct, so as to give such persons full opportunity to work out their respective taxes."

This section, from its adoption in 1834 to the passage of special county laws and the introduction of improved machinery, was one of the most important in the law, and, in some of our more thinly-settled and rougher

counties, is still a very important feature; but it is, at the same time, one which is made the cover and excuse for much fraud in the amount and quality of the work given in lieu of money in the payment of road tax, and one which we think adds not less than thirty per cent. to the actual cost of keeping our roads in very poor repair.

This section practically prevents the introduction of machinery for the following reasons: In the case of Pennsylvania Coal company *vs.* Kelley, (Luzerne Legal Register, page 49,) it is affirmed that "before a warrant can be issued for the collection of road taxes, the taxpayer must not only have had notice, but also full opportunity, to work out such taxes."

2. That "though notice be given, yet, if by management, artifice, or trick, the taxpayer, who is ready and willing to respond thereto, is not accorded full opportunity to work out his taxes he may appeal to a county equity to restrain their collection in money."

The opportunity to work out the taxes is a condition precedent to the issuing of a warrant for their collection; where they are assigned against a non-resident, notice may be given by advertisement, but the tenements must be permitted to work out the taxes if they offer to do so. (Miller *vs.* Gorman, 38 Penn. St. R., 309.)

Supervisors can make no contract the effect of which must be to deprive the taxpayer of the privilege to work out his taxes. (Childs *vs.* Brown Township, 40 Penn. St. R., 332.)

These decisions lead to but one conclusion, viz: That all of the road tax may be paid by work, thus leaving nothing for the purchase of improved machinery. If once purchased, it is true that the general act would permit the employment of labor as an equivalent for taxes, but as the act now stands cases may arise in which improvements may be prevented or retarded and it is this fact which has given rise to the complaint alluded to.

Another cause of dissatisfaction is to be found in the fact that the changes in the public travel and public needs since 1834 have shown that (at least in our thickly settled counties) our roads may be much more satisfactorily and economically kept in repair by the contract system, and the experience of each succeeding year plainly proves that sooner or later this system will become a necessity in all, as it has already in some, of our most densely populated counties.

Previous to the passage of the new Constitution, some localities obtained legislation which allows sufficient margin for the adoption of any approved plan of road-mending, and, at the same time, does away with the many evils which have crept into the system of the act of 1834, and yet at the same time they give every taxpayer the opportunity of working out his tax if he so elects but as these are not general acts they are not a relief from the present difficulty.

The act of April 1, 1873, (P. L. 476,) may serve as an example of the new plan, but we are by no means prepared to assert that it is the best of several which might be referred to.

Section 1 provides for the election of two supervisors of roads in each township, with the terms of office so arranged as to permit of the election of one every year.

Section 2 provides that "it shall be the duty of the said supervisors, within fifteen days after their election and every three years thereafter, to lay off and divide the public roads and highways in said township into sections not exceeding one half mile in length, which they shall number and enter and describe in a book by them for that purpose kept, to be called the road book of Thornbury township. They shall also distinctly specify therein what they may deem necessary for the improvement and

keeping in repair of the said public roads and highways. And when the supervisors shall have so laid off the said roads aforesaid, they shall, within three days thereafter, give at least ten days' notice by at least six hand-bills put up in the most public places in the said township, designating the time and place for the taxable inhabitants of said township to meet, at which time and place it shall be the duty of the said supervisors to attend and let out on contract, to the lowest and best bidder, the said roads as described and laid off into sections, one section at a time until they are all disposed of, to be kept in repair for the term of three years, according to the terms specified by the supervisors as aforesaid. *Provided*, That if any section or sections should not be then let on account of no bid satisfactory to the said supervisors having been made for the same, it shall be lawful for the said supervisors to cause the same to be repaired, either by private contract or otherwise, as they shall deem expedient. *Provided also*, That the said supervisors shall not be directly or indirectly interested in taking any section so let out as aforesaid."

Section 3 provides for the construction of new roads upon the same general principles.

Section 4 provides for a violation of the contract or a failure to keep the road in proper repair and also provides a means by which the supervisors may mend the road and charge the cost to the contractors.

Section 5 provides for cases of the removal of the contractor out of the township.

This, or a similar law, would, by its provisions, permit of the use of improved machinery and the adoption of the most economical methods of repair. It would also permit a single contractor, well provided with labor-saving machinery, to repair all or the greater portion of the roads of a township, and do away with the abuses which all admit follow the present system of accepting work as an equivalent for road taxes.

After watching the course of road legislation and the many abortive attempts to secure a satisfactory general law during the past eight years, the writer is firmly of the opinion that it is impossible to frame any single act which will be satisfactory to all sections of the State. Provisions which would be acceptable and economical in Bucks, Montgomery, or Lancaster, would meet with opposition and failure in Luzerne, Schuylkill, and Jefferson.

All attempts to secure the passage of a general act have met with opposition and defeat from two causes and two sources of exactly opposite nature. Counties whose surface and sparse settlement make it evident that the provisions of the act will not suit them, will, of course, oppose it. Such counties as already have local acts suited to their wants will also oppose the general act which repeals their special act and gives them one not so well suited to their wants.

To avoid both of these causes of defect, let the act (otherwise general in its provisions) provide a section which will permit, not only the use of either plan, but also provide for the adoption of any plan which may be a combination of the two. To such an act attach a section which will permit the taxpayers of the county, (or township,) to decide, by vote, which plan is best adapted to their needs, and avoid the antagonism of the other faction by allowing all our present special or local laws to remain unrepealed, except when those directly interested shall elect to adopt the provisions of the general act.

All of this may be accomplished by modifying our present general act, (that of 1834,) and adding a section to it which will convey the right of selection to the people directly interested; and we are satisfied that energy,

expended in this direction, will produce more beneficial results than have the efforts of the past seven years, during which time defeat has met every effort.

THE PENNSYLVANIA FERTILIZER LAW AND ITS EFFECTS.

When the act of June 28, 1879, (to regulate the manufacture and sale of fertilizers,) was before the Legislature for its consideration, it was urged by the agents of one or two manufacturers of this class of goods that the effect of the act (if passed) would be disastrous alike to both consumer and manufacturer: that the license fee would force manufacturers to remove their works to points outside the State in order to avoid the expense of a compliance with the law. The facts are that every year since the act became a law the amount of fertilizers manufactured in the State has constantly increased and is still rapidly increasing. As the average fee is less than forty dollars per year, it is evident that it could have little or no effect in causing the removal of factories. It was also claimed that it would prevent our own manufacturers from successfully competing with those of other States; but the facts prove the reverse to have been the case, for the manufacturers of other States, who sell goods in this State, pay the same license fees willingly and claim that they obtain a benefit therefrom. It was claimed that the mode of analysis proposed by the act would place the manufacturer at the mercy of any one who might choose to adulterate his sample before it was sent in to the Board for test, and that this system of adulteration would be resorted to for the purpose of obtaining the penalty which the act imposes. The fact is that no such condition of affairs exists, or has existed at any time since the passage of the act, but on the other hand we are overrun with requests from manufacturers that their goods may be analyzed and the result promptly reported, and it has been impossible for the Secretary of the Board to obtain samples with sufficient rapidity or in sufficient numbers to satisfy the manufacturers. It was claimed that the act would prevent farmers from mixing their own fertilizers; but the facts are that the provisions of the act afford farmers unusual facilities for compounding their fertilizers, and as the act only applies to manufacturers who sell the farmer who compounds for his own use is not in any way prevented from so doing. Agents of manufacturers outside of the State complained that the act would compel every agent in the State to take out a special license to sell their goods. The facts are that the non-resident manufacturer receives the same benefits from the act as do our resident manufacturers and pays the same license fee, and agents can sell either class of goods with equal facility, and now we find the complaint reversed.

These and a number of other objections were urged against the act by the agents of a few manufacturers, while on the other hand some of the most reliable manufacturers of the State supported the act, and now many more admit its benefit to both manufacturer and consumer and demonstrate their faith in its benefits by using the reported analyses of the Board as a means of advertising their goods; in fact, a good report of any brand of fertilizer in our published form is one of the best means of advertising which the manufacturer can adopt, and thousands of our fertilizer analyses lists are printed by the various manufacturers for their own benefit and at their own expense.

By the friends of the act it was claimed that it would exclude fraudulent goods from the market and encourage the introduction of better grades. A worthless fertilizer, sold in a single county to the amount of over five hundred tons, was tested and the report published, and next year the brand was with-

drawn from the market. To the farmers of one county alone this was a direct saving of over $5,000 per year, in the cost of this fertilizer alone, and of as much more in indirect loss by disappointment in expected results. Another fertilizer, sold at from twelve to twenty dollars per ton, was shown by repeated tests to be worth but *from fifty cents to ninety-three cents per ton;* a full report of this result having been made, the goods have been withdrawn from the market, thus saving the consumers not less than $2,500 per annum. When an attempt was made to introduce New Jersey marl into the State, at a price at least five times its value, a series of analyses were at once made by our chemist, and the results published promptly. This season the manufacturer offering the article has withdrawn them from the market, "for want of appreciation on the part of the farmers." The fact that while the cost of the article was from eight to twelve dollars per ton, our report of disinterested analyses showed that it was dear to the farmer at the cost of freight, prevented its further introduction and sale in the State. When ground limestone was introduced and extensively advertised as a fertilizer, our published analyses proved that it contained nothing of value which did not exist in the ordinary burned stone, and which could, in that form, be obtained at a much less price. One of our agents forwarded a sample of a fertilizer which was extensively offered for sale in the interior of the State; analyses proved that its value was but one dollar per ton, thus involving a loss to the consumer of about nine dollars per ton on every ton purchased, (cost ten dollars, value ninety-three cents.) Our report was widely circulated in the immediate neighborhood in which the goods were offered for sale, and their sale in that form and under that brand effectually prevented. Another name having been adopted, another series of analyses were made and similar results again reached.

These facts, and others of equal force which we might present, conclusively prove that the law is instrumental in forcing low-grade and fraudulent goods from the market, and to this, or even greater extent, favoring the introduction of honest goods. Every ton of worthless goods sold not only interferes with the sale of a like amount or equal value of good goods, but the disappointment which always results from poor fertilizers prevents the sale of other goods to the same or neighboring parties. A comparison of the results of different years since the act was passed leads to the estimate that one effect of the law has been that it has raised the actual value of our average fertilizers at least three dollars per ton (and some manufacturers estimate it still higher,) without any corresponding price, but really in the face of a decrease in price; as we consume from seventy-five to eighty tons per year we may fairly claim that the act saves the consumers of fertilizers at least $250,000 per annum.

From what we have written, we think it needs no further argument to convince any that the act, and its proper and fair enforcement, is an advantage to the consumer, who obtains better goods at a less cost than before the law was passed.

That the manufacturer who furnishes honest and fair goods is deeply interested in anything which drives poor and worthless articles from the market is too plain and evident to need argument, and if the manufacturer obtained no benefit from the law than this, he would be amply repaid for his license fee, but his benefits are not thus circumscribed. Our lists not only furnish the purchaser with the *comparative value* of each brand reported on, and the purchaser, knowing the cost of the article, can readily tell whether he receives value, and, if he does not, he is furnished with the means of doing better. Manufacturers are not slow to avail themselves of the advantage which a good report on our lists affords them, and a number

of them have had thousands of our lists published as an advertising medium of their goods. These lists, when placed in the hands of local agents, become a powerful aid in the sale of such goods as have stood the test provided by the law, and many of our leading manufacturers receive an equivalent in this way which is worth to them many times the license fee paid.

The argument which has been advanced by some manufacturers, that chemical analysis is not a safe guage of the valuue of a fertilizer, is scarcely to be maintained by them in the face of the fact that they all buy by analysis, and all supplies purchased by them must submit to this test and stand or fall by it; if correct when applied to the purchase of goods, it must be equally applicable to their sale to the consumer.

FERTILIZER LAWS OF OTHER STATES.

The correspondence of the Board demonstrates the fact that there are those who hold the opinion that fertilizer laws are for the benefit of the consumer only, and that the manufacturer has no right to expect that he shall receive any benefit from them. Such persons usually regard the manufacturers of this class of goods as always on the lookout to deceive purchasers and to furnish the lowest possible grade of goods for the money. While this may be true in a few instances, (as is proven by our published analyses,) yet we think that it will be found that there are many firms in the trade who are as jealous of their reputation and goods as those of any other trade or calling. A careful examination of our published lists will demonstrate that it is not difficult to select firms whose goods are uniformly good, and who always give the purchaser value for money received. We have always held that there was, and should be, no real conflict of interest between the manufacturer and consumer in this trade than in any other, and that if properly viewed the two interests are identical. It is to the interest of both to force fraudulent goods from the market, and the fact that the two interests are reached in different directions does not affect the fact. The consumer wishes to force this class of goods out of the market because they do not furnish him with a money value for which he pays; the honest manufacturer wishes them exposed because, by their fraudulent nature and possible low price, they injure and prevent the sale of reliable goods. One ton of fraudulent goods sold will probably prevent the sale of many tons of good articles, while the sale of a good fertilizer creates a demand for more of the same or other kinds. A consumer, once deceived, loses confidence, but if he gets good results for ten years, gives the manufacturer little credit. The one deception overbalances the nine benefits. In his attempts to carry out the fertilizer law of the State, the writer has often been made to feel that he occupied a peculiar position between the two interested parties. Every reasonable effort has been used to protect the interest of those who use this class of goods by furnishing them with reliable information in relation to the comparative values of the goods on the market, and yet at times we have felt it to be our duty to omit a few analyses on account of a possible or probable inaccuracy in the sample. In all cases it has been our effort to do strict justice to both parties and to carry out the theory that any act which was beneficial or just to one had the same bearing upon the other.

In all attempts to procure legislation of this kind, the first problem which presents itself is the means of providing funds for the necessary analyses, and this being settled, the construction of the remainder of the act is easily accomplished. On this point we find much difference of opinion, but we also note that all of the nineteen States having such laws have solved the

problem in the same way. One party claims that the consumer, being the benefited party, should pay all taxes or license fees; another claims that inasmuch as the intent of the act is to increase the sale of their goods and to force poor articles out of the market, the cost should be paid by the manufacturer; a third class hold that the funds should be supplied from the general treasury of the State. Of the three plans, we consider the latter to be the most objectionable. The funds in the State treasury are the property of the general taxpayer, who, if at all, is only indirectly interested in the protection to be afforded; and it seems evident that the parties interested are the proper ones to bear the expense. This reduces the consideration to the two classes—the manufacturer and consumer—and we find that both of these parties agree as to the propriety and benefits of such a law, but (perhaps naturally) disagree as to whom should pay for these benefits. To decide the matter between them, we have the following considerations which must and will effect the result: It is a principle in a taxation that, in the end, all taxes are paid by the consumer; that if, as in other States, a privilege tax of fifty cents is collected from the manufacturer or agent it eventually comes from the consumer. Our correspondence causes us to believe that there is hardly a single consumer of commercial fertilizers in our State who would not willingly pay twenty-five or fifty cents per ton for the protection afforded by a properly enforced law, and many have expressed their entire willingness to pay even more. This, then, would seem to settle the proper status as to the necessary expense, but the problem presents another consideration which should not be lost sight of, viz: the interest which the manufacturer has in the act. The extent of this interest is difficult to estimate, but the fact that manufacturers annually print and distribute many thousand copies of our analyses lists as an advertising medium proves that some of them are willing to acknowledge to direct benefits received; others admit that the effect of the act has been to greatly increase the demand of good fertilizers, and that, since the passage of the act, the amount consumed in the State has increased to an unexpected degree. These, and other facts, which might be offered prove an almost equal interest on the part of the manufacturer, and at least warrants the conclusion that the expense may properly be divided between them. This decided, we next note that it is almost an impossibility to collect the needed fee direct from the consumer; sales are made at distant points, often in quantities of one ton or less, and a proper collection is out of the question. In view of these and other facts, the nineteen States having these laws all collect the fees from the manufacturer before the goods are sold to the consumer, and thus place the solution of the problem in the hands of the manufacturer, who has the power to arrange the matter in his own way, by either charging it to the party purchasing or allowing it to go into the general expense account. A number of States have fixed the privilege in tonnage fee at fifty cents per ton, and it becomes a very simple matter for the manufacturer to collect it from the consumer and avoid all trouble.

In order that our readers may compare the fertilizer act of this State with those of the eighteen other States, we here present an abstract of these laws, from which it will be noted that in some the amount of the license fee is greatly in excess of that required by the law of our State, and, in one or two cases, is so high as to almost be prohibitory in its effect, thus throwing all of the trade into the hands of a few wealthy manufacturers.

Pennsylvania.

Section one compels the manufacturer to place upon his bags the usual brand showing the proportions of phosphoric acid in three forms, and of potash and ammonia.

Section two compels him to record this analysis in the office of the State Board of Agriculture, and to pay a license fee varying from $10 to $30 on each brand, the amount of license fee depending upon the amount sold.

Section third imposes a penalty of from $25 to $200 for any violation of the provisions of the act.

Section four makes it the duty of the Board of Agriculture to collect and have analyzed samples of such fertilizers as are found in the State.

Section five sets apart all license fees as a special fund which the expenses of analysis shall be paid.

Section six exempts certain natural products from the provisions of the law.

Delaware.

Every manufacturer whose sales exceed one thousand tons per annum must pay a license fee of $40, and all others one of $30, to the State chemist. It is made the duty of a committee named by the levy court to select and send samples to the chemist, but they are prohibited from informing him as to the name of the manufacturer. The chemist must analyze all such samples, attach to his analysis a valuation based upon twelve and one half cents per pound for available phosphoric acid, ammonia at twenty-two cents, and potash at eight cents per pound. Any manufacturer who fails to furnish the chemist with a sample of his goods on or before the 1st day of May in each year is liable to a fine of $50, one half for the informer and the remainder for the State. Every package must have the proper analysis attached, and non-resident manufacturers are represented by their agents. It is the duty of the levy court to have published for gratuitous distribution the analyses of the samples sent by the manufacturers, and also the analyses of the samples obtained by its committee. Any one defrauded in the purchase of a fertilizer may recover twice the amount paid or to be paid for the same. The manufacturer must pay the chemist $30 for the analysis required by the law.

Mississippi.

Every manufacturer of fertilizers must keep, in a place where customers may readily see it, an analysis of his goods, and it is the duty of the State chemist to furnish this analyses from samples furnished by the manufacturer. A certificate fee of $20 must be paid to the State chemist for each brand offered for sale in the State. Any purchaser may draw samples for the purpose of sending them to the State chemist, but must do so in the presence of witnesses. (The analysis in this case is to be made without charge.) Any purchaser, finding that he has been defrauded in any way, is entitled to recover double the amount paid or to be paid, and the manufacturer is made responsible for all goods sold by agents.

Vermont.

The manufacturer must pay a license fee of $50 annually for each brand, and must attach to each package the proper analysis and the word licensed. Manufacturers, or their agents, must file a bond of $5,000 for the payment of fines, &c., &c., and any violation of the laws subjects the offender to a fine of $1,000. The chemist of the University of Vermont and State Agricultural College is made the State chemist, and it is his duty to make analysis of samples furnished by the Secretary of the State Board of Agriculture. All samples drawn by this officer must be taken in the presence of two witnesses, and must be divided into three portions, one of which is sent to the State chemist for analysis, one is sent to the manufacturer, and one retained by the Secretary of the Board. The Secretary of the Board is made liable to a penalty of $1,000 for any failure in his duty in selecting samples. The State chemist is to receive $5 for each analysis, and the Secretary of the Board $2 per day and expenses while selecting samples for analysis. These fees must not exceed the amount paid as a license fee on the brand to be tested.

New Jersey.

All packages of over one hundred pounds must be properly stamped with the analysis. The chemist of the Board of Agriculture is made an inspector of fertilizers: it is made his duty to analyze samples for purchasers for a fee of $15. Any violation of the act is punishable by a fine of from $50 to $100, one half of which is for the use of the informer, and the remainder for the public-school fund of the county. The action of the law is limited to fertilizers selling for more than one half cent per pound.

Kentucky.

This act compels the manufacturer to obtain from the State chemist, at his own cost, an analysis of the goods, which must be stamped on the bags. A license fee of twenty dollars for each brand must be paid to the State chemist, who will issue a license for one year. The law fixes the amount of variation from the guaranteed analysis, which may be allowed before fraud can be charged, and imposes a penalty of from

two hundred to five hundred dollars for all violations of its provisions. It also fixes the minimum of ten per cent. of available phosphoric acid in acid phosphates and dissolved bone, and of eight per cent. in an ammoniated phosphate. Any purchaser may send the State chemist a sample of the fertilizer purchased, and he is entitled to an analysis free of cost, provided there is a sufficient fund arising from license fees to pay the chemist for his work. The act only applies to such fertilizers as are sold for more than half a cent per pound.

Ohio.

This act fixes the minimum price of fertilizers exempt at ten dollars per ton and imposes a license fee of twenty dollars for each brand. The manufacturer is compelled to file a copy of the analysis and a sample of the fertilizer with the Secretary of the Ohio Board of Agriculture, and it is made the duty of this officer to have a proper analysis made of every licensed fertilizer sold in the State at least once each year, and the license fees are appropriated to this purpose. Violations of the law subject the offender to a fine of from two hundred to five hundred dollars for each offense. The Secretary of the Board of Agriculture and his deputies are empowered to draw samples, not exceeding two pounds, whenever they think proper, and all suits are to be brought in the name of the State by the Secretary of the Board. This act is essentially the law of Pennsylvania, with the addition of the clause exempting all brands selling for less than ten dollars per ton.

Massachusetts.

The minimum price of fertilizers to which the act applies is fixed at twelve dollars per ton and the usual label must be attached to all packages. A license fee of fifty dollars must be paid for each brand sold or offered for sale. Any one selling in violation of the law, or with a fraudulent analysis, is punishable by a fine of from fifty to one hundred dollars. No provision appears to be made for an analysis of goods sold in the State.

Connecticut.

The manufacturer is compelled to affix the proper brand to every package, and the State Experiment Station makes all rules in relation to what shall be stamped on the packages. All fertilizers selling for less than ten dollars per ton are exempt from the provisions of the act. The manufacturer must pay an analysis fee equal to ten dollars for each and every ingredient which he claims for his fertilizer, and every person who acts as an agent for the sale of fertilizers must each year register his name and address with the director of the station and furnish the station with a sample of the goods offered for sale. Pulverized leather in any form is subject to a special registry, and a certificate showing its nature must be attached. All fish guanos must be treated with sulphuric acid or other chemical before it can legally be offered for sale. All violations are liable to a fine of two hundred dollars. The analysis fee is set apart for the benefit of the station.

North Carolina.

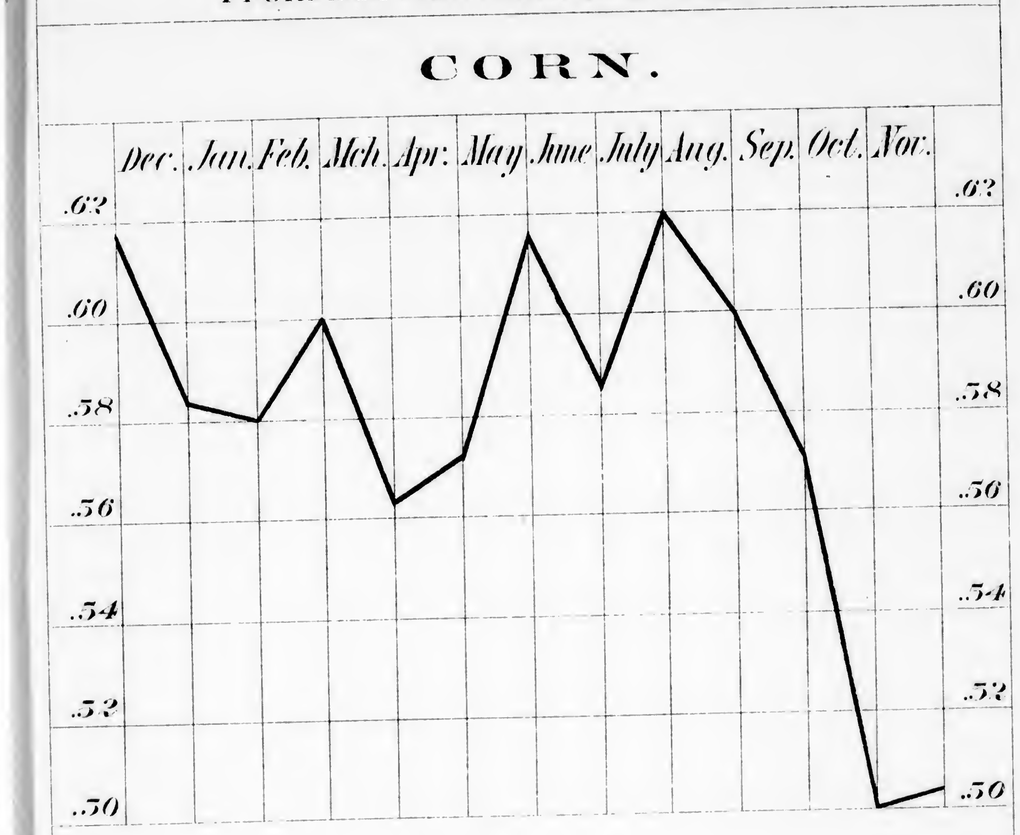
In this State, all manufacturers pay a privilege tax of five hundred dollars on each brand and a further tax of fifty cents per ton on all sales. All packages must have the proper stamp showing the percentage of the usual ingredients, and any violation is punishable by a condemnation of the goods and their sale for the benefit of the Board of Agriculture. The use of a fraudulent analysis is punishable by a fine of ten dollars for each and every package offered—one half for the benefit of the informer and the balance for the Department of Agriculture. The Department of Agriculture may compel all transportation companies to furnish monthly statements of the amount of fertilizers shipped by them, and the Commissioner, in case of a refusal to furnish this information, may obtain it from the books of the company. The chemist of the State University at Chapel Hill is made the State chemist. Every manufacturer of fertilizer is compelled to make affirmation at the office of the Register of Deeds of his county, on the first Monday in January, April, July, and October, of the number of tons sold and shall pay thereon the privilege tax of fifty cents per ton. This tax cannot by a change in ownership become due a second time upon fertilizers in transit. Any person or corporation bringing unlicensed goods into the State is liable to a fine of ten dollars. Any farmer going out of the State and buying and bringing in unlicensed goods is liable to the same fine as for other violations of the act. All fines, fees, taxes, &c., are to be paid into the State treasury for the benefit of the Board of Agriculture.

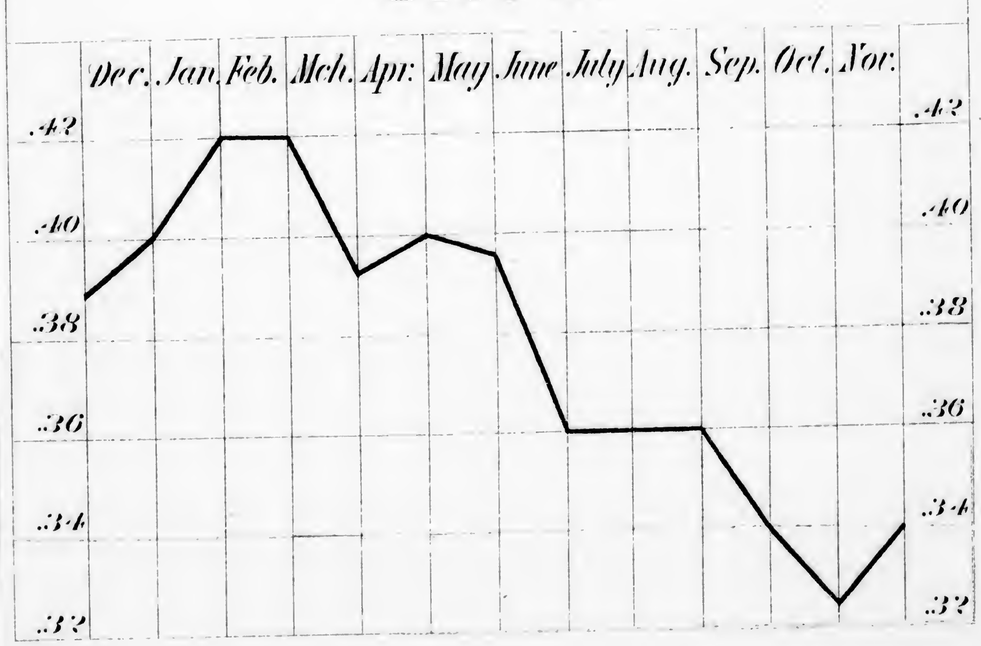
Tennessee.

Section first provides for the use of the usual analyses on all packages, and exempts all goods sold at a price less than ten dollars per ton from the action and cognizance of the law.

Section second gives the Commissioner of Agriculture the power to fix a minimum amount of "ammonia, potash, and available phosphoric acid," which every fertilizer

PRICES OF CORN AND OATS IN PHILADELPHIA.
From Dec. 1st. 1883, to Dec. 1st. 1884.





shall contain, and a subsequent section inflicts a penalty in case any fertilizer falls below this minimum amount. Section third provides for a privilege tax of fifty cents per ton, which shall be applied, under the direction of the Commissioner, to inspection, analyses, &c. Section fourth authorizes the Commissioner to appoint four inspectors for the State, with power to displace them at his pleasure. The pay of these inspectors is limited to one third of the privilege tax collected by each, but can in no case exceed five hundred dollars per year. Section sixth constitutes the experiment station at Knoxville the proper authority in the matter of making analyses under the law. All excess of income over the expense of "inspection, salaries, express, and tags," shall be paid monthly to the University of Tennessee for the expense of analyses to be made in accordance with the law. A fine of one hundred dollars is inflicted and becomes the property of the experiment station.

The rules adopted by the Commissioner provide that all acid phosphates and dissolved bones must contain not less than ten per cent. of available phosphoric acid, all ammoniated super-phosphates not less than eight per cent., with not less than two per cent. of ammonia and not less than one per cent. of potash.

Indiana.

This act compels the following: The manufacturer must furnish the State chemist with a sample of the goods which he proposes to offer for sale in the State, and must make affidavit that it is a fair sample. That each manufacturer shall attach to each package a label of a certain form prescribed by law and furnished by the State chemist. This label shall contain the analysis of the sample sent to the chemist by the manufacturer, and is a guaranteed analysis. Selling goods without a proper label is punishable by a fine of one hundred dollars. The professor of chemistry at Purdue University is constituted the State chemist, and his fees for analysis of samples, sent by the manufacturer, is fixed at two dollars for each analysis. The State chemist is not bound to furnish the labels in less than five hundred lots, and is to receive one dollar per hundred for them.

South Carolina.

By the act of December 23, 1879, the Commissioner of Agriculture is made a State inspector of fertilizers, and is granted the power necessary to carry out the duty of the former inspector of fertilizers, whose office he supersedes. Each manufacturer offering fertilizers for sale in the State must pay to the Commissioner of Agriculture twenty-five cents per ton for every ton sold, which amount is for the exclusive use of the Department of Agriculture. An analysis must be stamped on the bag or package, and any one selling fertilizers without the proper payment to the Commissioner, without the proper stamp, or with a fraudulent brand, shall forfeit ten dollars for every bag or package so sold The Commissioner is authorized to make such analysis as he may deem best, and all fines, forfeitures, &c., &c , are for the sole use and benefit of his Department. Any railroad carrying a fertilizer upon which the privilege tax of twenty-five cents per ton has not been paid, or in packages to which the proper labels are not attached, is liable to a fine equal in amount to the value of the goods thus transported. This fine, in common with all others, is for the use and support of the State Department of Agriculture.

Alabama.

Section first provides for the appointment of a Commissioner of Agriculture with a salary of twenty-one hundred dollars, and for an assistant commissioner.

Section fifth makes it the duty of this Commissioner to enforce the following regulations in relation to the manufacture and sale of fertilizers:

1. That all packages shall be branded in a manner similar to that required by other States.

2. That the analysis on the bags shall be *de facto* a guaranteed one, and any falling short shall be punishable with a fine of five hundred dollars.

That all bags shall be accompanied with proper tags bearing the word "guaranteed," for which tags the Commissioner shall receive payment at the rate of fifty cents per ton on all fertilizers sold in the State. A failure to attach the tags is punishable by a fine of one hundred dollars, one half of which goes to the informer.

That one third of the product of the sale of these tags shall go to the treasurer of the Agricultural and Mechanical College of the State, and the remaining two thirds to the Commissioner of Agriculture for the salaries and expenses of the office.

Georgia.

Section first constitutes the State Commissioner of Agriculture the guardian of the interest of the consumers, and compels all manufacturers selling in the State to submit to him a sample of the goods which they propose to sell; under certain conditions, as to value. &c., &c., he is empowered to forbid their sale in the State. In all suits brought by the Commissioner, one half of the penalty goes to the informer and the remainder to the school-fund of the State.

Section second imposes a penalty for violation of any provision of the act, and names the possible points of violation.

Section third specifies the different items of the brand or marking which must accompany each package or parcel and imposes the penalties of section 4310 of the code of 1873 for any violation.

Section fourth fixes a minimum standard for all fertilizers of ten per cent. soluble phosphoric acid for all dissolved or acidulated S. C. Rock, and of eight per cent. available phosphoric acid in other fertilizers. The minimum of ammonia in all ammoniated fertilizers is fixed at two per cent.

Section fifth authorizes the employment of a State chemist with a salary of $3,000 per annum.

Section sixth provides for the appointment of inspectors with salaries of $1,500 per year, to be paid out of fees provided for by section seventh, which imposes a fee of fifty cents per ton on all goods sold, to be paid by the manufacturer or agent making the sale.

Sections eighth and ninth relate to tenure of office of the chemist and inspectors, and give the Commissioner of Agriculture power to remove or appoint the inspectors and chemist.

Sections ten and eleventh give the Commissioner the power to make all or any needed rules for the proper carrying out of the act.

West Virginia.

Section first provides for the attaching of the usual analysis to the packages, but in addition to this provides that the soluble phosphoric acid, as stated in this analysis, shall be soluble in a neutral solution of citrate of ammonia at a temperature of one hundred degrees Fahrenheit.

Section second provides a penalty for a failure to attach the proper analysis, or for attach ing a false analysis, of from $50 to $200, and gives the circuit court of the county the power to try all cases under the law.

Section third makes it the duty of the professor of chemistry of the West Virginia University to analyze, free of charge, all samples furnished by purchasers.

Section fourth makes the certificate of analysis from the professor of chemistry of the University *prima facia* evidence of the fraud, if committed.

Virginia.

Section first provides for the usual analysis on each package sold or offered for sale.

Section second imposes a penalty of one hundred dollars (two hundred for a second offense) for any violation of the act, and that one half of the fine shall go to the informer.

Section third gives the purchaser the right to hold the agents of non-resident or absconding manufacturers responsible for the penalty.

Section fourth limits the action of the law to fertilizers sold for more than three fourths of a cent per pound; it also defines the meaning of the terms "soluble" and "insoluble" as applied to phosphoric acid.

Section fifth imposes a penalty of five hundred dollars, fine and imprisonment, or both, for using the brand or mark of another manufacturer.

By a subsequent act the enforcement of the law is delegated to the Commissioner of Agriculture.

Maryland.

Section first compels the affixing of the proper analysis and repeals former acts.

Section second imposes a penalty of fifty dollars (seventy-five for a second offense) for failing to attach the analysis or for attaching a fraudulent one, and gives one half of the penalty to the informer; it also makes the circuit court of the county in which the offense is committed the arbiter.

Section third gives any one who can establish the fact that he has been in any way defrauded in the purchase of a fertilizer the right to recover an amount equal to that paid for the goods, and, in the case of non-resident manufacturers, holds the agent making the sale responsible for the penalty.

Section fourth specities that the act shall apply to all fertilizers sold for more than a half cent per pound, and, further, that the price allows no exceptions of any kind.

Section fifth defines the meaning of the term "soluble phosphoric acid" to be readily soluble in pure cold water, and insoluble phosphoric acid to be "acid in any form or combination which requires the action of an acid upon it to cause it to become readily soluble in pure cold water."

Section sixth provides a penalty of one hundred dollars or imprisonment for six months, or both, who shall use the brand or trade mark of any other manufacturer, or who shall, in any way, adulterate a fertilizer.

New York.

Section first provides that every package shall have affixed to it a statement showing the percentage of phosphoric acid soluble in water and of total phosphoric acid, the percentage of potash and of nitrogen soluble in water and the total percentage of nitrogen or ammonia.

Section second provides that any manufacturer not so affixing the proper constituents of the fertilizer shall forfeit to the purchaser the sum of one hundred dollars, and for attaching a false statement (as proven by subsequent analysis) shall forfeit to the purchaser the sum of two hundred dollars for each sack, box, or package.

Section third provides that in determining the actual percentage of the above-named elements a margin of one fourth of one per cent shall be allowed, but that any greater deficiency shall be charged as intentional fraud and be punished accordingly.

Section fifth permits the suit to be brought in the county in which the purchaser resides.

Section sixth defines commercial fertilizers as meant by the act to be any fertilizer sold for more than one half cent per pound, and excepts marl and guanos not manipulated.

A careful examination of these laws brings the following points of difference between them and our own acts, to view: Those of several of the States exempt any fertilizer selling at a price less than twenty dollars per ton. This we have always considered to be an error, and our experience during the past six years in this State has proven that the greatest amount of fraud is in the low-priced goods, and that, as a rule, none of them are worth the price demanded for them. In some few cases, the minimum is still lower, and is, in the same proportion, more objectionable. We find the percentage of fraud to be very low in high-priced goods, and, after the experience attained, would prefer to exempt all goods selling for *more than thirty dollars* rather than those selling below twenty, and we believe that the consumer would suffer less.

In several cases, the State act fixes the minimum of phosphoric acid, potash and nitrogen, and no fertilizer containing less can be sold. This would be an error when applied to our State, for the experience of many proves that the most economical results are reached without either potash or nitrogen. In these States, it is found that this minimum rate naturally degrades the goods to its own level, and that the manfacturers, finding that they will receive little credit for any amount above the minimum, naturally keep the grade of the goods lower than they would otherwise do. We believe it much better to permit the manufacturer to have entire freedom in the composition of his goods, and give him the widest possible range in supplying the demands of the trade; a demand for high-grade goods, though very desirable, cannot be forced, and any attempt to thus force it will but delay the inevitable.

It will be noted that one or more of these acts places a tax of five hundred dollars upon every brand offered in the State, and a further tax of fifty cents per ton on all sales, thus practically throwing the trade into the hands of a few, and effectually excluding the small manufacturer. Our experience would lead us to regard this as a grave objection, and one which would have a tendency by restricting competition, to increase the price of this class of goods. We deem it much better to regulate the fee on actual tonnage sales, and thus allow the small manufacturer an equal chance of competing, and allow the consumer the benefit which competition naturally affords.

A perfect fertilizer law will protect the interests of the consumer and manufacturer alike; it will admit of full and free competition by all; it will allow the manufacturer the widest possible margin in the composition, but once having established this composition by a properly recorded analysis, will hold him to it; it will place the cost upon the parties directly interested, and so arrange its adjustment as to allow the manufacturer to collect it with the price of his goods, should he deem such a course advisable; it will except no fertilizer but barn-yard manure, and other natural and

variable products, and, above all, it will not make the selling price the criterion of exception; it will regulate the license fee, first by the brand. placing it upon each and every one placed on the market, and second, regulating its amount by the amount of each sold; it will give the manufacturer an opportunity to show cause of error in analysis or sample before publication of the result is made; it will provide that samples shall be selected by duly qualified agents, who shall be properly hedged in by oath or affirmation; it will not specify any special officer as chemist, but will admit of a proper selection of this officer; it will place between the manufacturer and consumer not less than three disinterested persons, one of whom draws the sample, one of whom records it and sends it to a third, who is the chemist, to make the analyses; it will provide for the prompt publication of the result of all analyses, in order that those whose goods stand the test may receive the benefit, and that the consumer may be able to pass judgment upon all; it will in no way restrict the right of the manufacturer to place as many brands on the market as prudence will dictate, and will give the purchaser a wide range of choice.

Such a law it will be to the interest of all parties to support fully, and we think that, after a candid investigation, it will be found that the law of Pennsylvania best protects the interest of all parties and at the least cost

ANALYSES OF FERTILIZERS.

The greatly increased interest which has been manifested in our published list of fertilizer analyses, and the increased demand for these lists, (far beyond our ability to supply it,) has given rise to many questions relating to the mode of procuring the samples, mode of analyses, valuation, and proper manner of using the lists, and it is proposed in this article to give an outline of the mode of procedure and the means of comparison afforded by the published lists.

Section fourth of the act of June 28, 1879, provides that "it shall be the duty of the Board of Agriculture to analyze such specimens of commercial fertilizers as may be furnished by its agents, said samples to be accompanied with proper proof, under oath or affirmation, that they were fairly drawn." Under the provisions of this act, a number of agents have been appointed in different portions of the State, and these agents select and forward the samples for analyses. Most of them are furnished with a proper tube for sampling without opening the bag, and with air-tight tin boxes in which to forward the sample. As the agents in different portions of the State are unknown to the manufacturers and to each other, we often receive duplicate samples of the same brand from different parts of the State. In such cases, but one sample is tested; the amount of money at our disposal will not permit of repeated tests of the same brand, and hence care is taken, that, as nearly as possible, the number of tests made of any brand shall correspond with the relative amount sold in the State. The only variation from this rule is made with brands which are evidently fraudulent or of little value, and these are often tested oftener than our rule will warrant for the purpose of comparing results of samples selected over a wide area of territory.

Samples are sent from the office of the Board to the chemist by number, and the result returned to this office as soon as practicable. As soon as received, a copy of the analysis is sent to the manufacturer and to the agent sending the sample, and, as a rule, no analysis is made public until the parties interested have had an opportunity for an appeal and to produce evidence of an error. When sufficient evidence is produced to show even

good cause for a doubt, another sample is drawn, or, in case this is impracticable, the analysis is withheld for further examination. It is not the wish of the Board (nor was it the intent of the law that it should be done) to injure any manufacturer, and we have laid it down as a rule that the manufacturer should have the advantage of any reasonable doubt or suspicion of error in the selection. If the question is simply one of the correctness of the analysis (the correctness of the sample being admitted) another test is made of the remainder of the sample and the chemist holds himself ready, in all such cases of dispute, to furnish a reputable chemist with a portion of the reserve sample for a comparative test.

When the analyses are accepted as correct, they are arranged in the tabulated form which has become familiar to those interested in the consumption or sale of fertilizers, and which has been adopted by other States. These lists furnish the following items of information, viz: the name of the fertilizer, the name and business address of the manufacturer, the place at which the sample was selected, and the percentages of soluble, reverted, and insoluble phosphoric acid, of potash and nitrogen, and the "estimated commercial value per ton."

By multiplying the percentages of these ingredients, as given in the tables, by twenty, the number of pounds of each in a single ton is obtained. Phosphoric acid, potash, and nitrogen are all marketable commodities, and, for the purpose of the manufacture of fertilizers, are quoted daily in the proper trade journals, so that the value or cost of either, at any time, may readily be obtained. There is no more difficulty in ascertaining the actual market price of a pound of phosphoric acid (in either of its three forms) than there is in knowing the value of a bushel of any kind of grain. But, like grain, their values are continually fluctuating and changing with the operation of the laws of supply and demand; fertilizer supplies are also subject to the same variation in actual value and quality as grain; the fact that No. 1 wheat is quoted at a certain price does not preclude the sale of No. 2 or No. 3 grain at lower rates; in the same manner, the quotation of nitrogen or potash in its most valuable form at a certain price does not prevent the sale of lower grades at proportionately lower prices. Nitrogen, potash, and phosphoric acid from different sources have widely varying differences in *actual* value and always sell at prices proportionate to the value.

Having given the market value of each ingredient and the amount of each in a ton of the mixture, it requires very little calculation to enable any one to arrive at the commercial or market value of the fertilizer. If a farmer has a mixture of corn, wheat, oats, and barley on his barn-floor, and knows just how many bushels of each is in the mixture, he can readily tell the value of the pile. If some of the wheat is No. 2 or No. 3 in grade, it does not alter the case, provided he knows the market value and amount of each. In either case, the value of the mixture is fixed by the price of the different ingredients in the open market. In the case of the grain, we only need to know the exact proportions of each, and in the case of the fertilizer it is the work of the chemist to determine this for us, and he decides by the source from which it was derived, whether the potash, nitrogen, or phosphoric acid was No. 1, No. 2, or No. 3 in quality.

As our work of analyses and comparison is to extend over the whole year, our values for each ingredient must necessarily be selected at the commencement of the year, and, having been once selected, must be adhered to during the whole of the year. If they were changed with each variation of the market, or even every month, the value of our lists as a means of comparison would be destroyed and much of their value lost.

An analysis made in March could not then be compared with one made in August, for the values of the ingredients would have been changed to suit the market.

After our values have been fixed for the year, a change in the market may enable the manufacturer to obtain a certain line of supplies at rates much below those we have taken. In such cases, the manufacturer receives the benefit, but it is shared by all alike, and hence does not influence the result.

The percentages given by our chemist furnish the number of pounds of each ingredient in one ton of the fertilizer, and these, multiplied by our market values per pound, give us the "commercial" value per ton. We use the words "commercial value" because we wish thereby to distinguish it from the "agricultural value." The agricultural value per ton depends upon the effect produced upon the crop, and may or may not be dependent upon the commercial value. The agricultural value is variable, and depends upon circumstances over which neither the manufacturer nor consumer can have any control. The weather, the crop, the mode of application, all influence and effect the agricultural value. To a soil destitute of potash, a potasic fertilizer would have a high agricultural value, yet, in both cases, its commercial value would be the same. A dissolved S. C. rock, (containing nothing but phosphoric acid,) might produce a certain effect and have a certain agricultural value upon one soil, when, if applied to a soil or crop of a different nature, it would have an agricultural value entirely different, and this, too, without any change in its actual or commercial value. A fertilizer with a fair commercial value of forty dollars per ton might, during a dry season, be applied to a crop and be followed by positively injurious effects, and, hence, be assigned a very low commercial value, but applied to the same soil and crop, but under different conditions as to moisture another year, its agricultural value might be above its commercial value or cost. Again, A's acidulated S. C. rock may have a commercial value of twenty-five dollars per ton and B's complete super-phosphate one of thirty-five dollars per ton, but it will not do to assume from this that A's is necessarily worth ten dollars per ton more for all purposes, soils, and crops. The acidulated rock contains but one element of plant food while the complete phosphate contains, at least, three. In comparing the commercial values, as given in our lists, the reader will exercise the reasonable precaution of comparing those of like kinds with each other. The farmer finds all kinds of grain quoted in the same column of his county paper, yet he does not make the mistake of comparing horse feed with bread stuffs, or cornmeal with flour by the prices as there given. He will compare the different grades of wheat with one another and not with oats or corn. In like manner, those who read our analysis lists must compare one grade or make of acidulated rock with another—one complete fertilizer with those of the same grade. He can no more (satisfactorily) compare the commercial value of a ton of acidulated rock with that of a ton of complete fertilizer than he can the market value of a barrel of flour with that of a bushel of oats. He will compare oats with corn before arriving at any conclusion as to their value as horse food. If, on our list, he finds that A's S. C. rock is valued at twenty-five dollars and B's at thirty dollars per ton, he is fully justified in forming the opinion that B's is worth *more* than ten dollars per ton more than A's. It is worth more because it not only cost less, but because there is a saving in freight and handling.

Our lists make no pretense of telling the farmer whether a fertilizer, rich in potash, phosphoric acid or nitrogen, is best suited to his farm or crops. This he must decide for himself; but, having decided it, our lists will show

him where he can get each of these elements at the lowest cost, and we claim no more for them—any greater claim would only mislead the consumer.

The question has been raised as to whether these lists furnish the information which we have claimed for them, and it has been stated by interested parties that they do great injustice to the manufacturer. We can probably best answer this argument by the following quotation from the widely circulated advertising sheets of one of the most extensive manufacturers of fertilizers in the State, who tells his patrons that "it will be found that the manufacturers who object to the publication of the reports are those whose goods, in commercial value, run below their selling price, and those whose goods run lowest are foremost in their denunciation of the reports published by State Boards of Agriculture." The very manufacturers who are loudest in their denunciation of "commercial values," when adopted for the benefit of the consumer, will not buy their fertilizer supplies except upon a guaranteed analysis, and at a fixed price per "unit" (per cent.) for what they actually contain, as shown by chemical analysis. They keep their own chemists at fair salaries, for the purpose of ascertaining exactly not only the amount of each ingredient, but also the source from which it was obtained. They not only demand that the article which they purchase shall contain the stipulated percentage of nitrogen, potash, or phosphoric acid, but they further insist that it shall come from a certain source, and the rules of the trade will support them in demanding a drawback for any shortcoming in either the relative amounts or the agreed—upon source of derivation. We cannot admit that a rule which works so well for their protection will not work as well for the consumer; such an admission or claim would be foolish. We are then forced to believe that the argument is made for argument's sake only, and has no practical value. The manufacturer insists upon a chemical analysis and a valuation before he will buy the ingredients which he proposes to use in his fertilizer. We aim to furnish the customer with the same facilities, and he may adopt them or not as he thinks best—but if good in one case they are in both.

By the application of common sense, and what we have already written, the consumer may draw his own conclusions as to any fertilizer which always is found with a commercial value below its selling price, but he must, at the same time, remember that our estimated value per ton does not include freights, commissions to agents, rent, bad debts, &c., and that the fact that a fertilizer has a commercial value a few dollars per ton below its cost does not prove that the manufacturer does not furnish an honest article, but it does prove that another (who is at the same expense) does furnish, at the same cost to the farmer, a better article.

We have several times been asked to account for the fact that manufacturers who are shown by our list to furnish goods having a commercial value *above* their selling price can continue in the business and make money by it. This may be accounted for in several ways. The prices assumed by our chemist were fixed nearly a year ago, and since then the market value of these goods have fallen very much, but our values have not been changed. To illustrate, we copy the following table from the report of the New Jersey Experiment Station, and as the prices therein given correspond with our own, the illustration loses none of its force :

	Manufacturers average Retail Prices for—		Stationsschedule of prices for 1884.
	1883.	1884.	
	Cents.	*Cents.*	*Cents.*
Cost per pound of nitrogen from nitrate of soda,	19.7	16.9	18
Cost per pound of nitrogen from sulphate of ammonia,	20.8	17.1	22
Cost per pound of nitrogen from dried blood,	21.1	18.3	18
Cost per pound of nitrogen from ammonite and tankage,	20.6	15.8	18
Cost per pound of soluble phosphoric acid from bone black,	9	7.3	10
Cost per pound of soluble phosphoric acid from S. C. rock,	10	8.6	10
Cost per pound of reverted phosphoric acid from bone black,	6.5	6.7	9
Cost per pound of reverted phosphoric acid from S. C. rock,	7.3	7.8	9
Cost per pound of insoluble phosphoric acid from bone black,	3.3	2.9	2¼
Cost per pound of insoluble phosphoric acid from S. C. rock,	2.6	1.9	4
Cost per pound of potash from high grade sulphate,	7.2	7.2	7¼
Cost per pound of potash from kainit,	4.5	4	4¼
Cost per pound of potash from muriate,	4.2	3.7	4¼

The first two columns show the market prices during the latter part of 1883 and of 1884, up to November 1st; the third column shows the values used by our chemist. It will be noted that in every case the difference is in favor of the manufacturer. The differences appear small, but, when applied in actual practice, they assume a position of more importance. For illustration, let us assume that the analysis of a fertilizer shows seven per cent. of soluble, four per cent. of reverted, and three of insoluble phosphoric acid, combined with three of potash and three of nitrogen. By the figures adopted by our chemist, its commercial value would be $34 75, while, by the figures representing the *actual market value* of the ingredients, the commercial value would be $30 15, or a difference of $4 60 in favor of the manufacturer; and it should be borne in mind that where the manufacturer purchases his supplies in large quantities, the actual difference is still greater; in fact, actual purchases within two weeks of the present time would reduce the commercial value of our supposed fertilizer to $28 75 per ton.

An extensive manufacturer of chemicals, in the course of his business, produces a waste product containing a large percentage of nitrogen. This waste product is of such a nature that, unless removed in twenty-four hours after its production, it becomes a nuisance and can only be removed at an expense of one dollar per ton. Instead of removing it at considerable cost, the manufacturer combines the manufacture of a special fertilizer with his other business. He purchases acidulated S. C. rock at a cost of three quarters of a cent per pound, potash for even a less price, and, by combining them with his waste product, obtains a fertilizer to which our chemist assigns a commercial value of $27 75 per ton and which he readily sells for $25 00 per ton. The nitrogenous material cost him nothing, the other ingredients cost, say, three quarters of a cent per pound ($15 00 per ton,) the "filler" cost nothing, and the mixture can be sold for one and one quarter cents per pound. He can furnish the article, with a high commercial value, because he has special facilities for obtaining his nitrogen; others who have not these facilities cannot furnish a fertilizer of *equal* commercial value for the *same price*, but this is no business of the consumer, who cares little as to the cost of the fertilizer provided it is good.

Another manufacturer has a patented process for the preparation of animal matter containing nitrogen, and by this process can so prepare it as to obtain from the animal matter certain oils and other products which will repay the greater portion of the cost of the process. He can, therefore, use more matter containing nitrogen than his competitor who has to purchase his supply at market prices, and hence can furnish a fertilizer with a high commercial value, which, at the same price per ton, cannot be attained by his competitors. This is a matter of business, and does not, in any way, concern the consumer, but it affects the value of the fertilizers of this manufacturer, as shown by chemical analyses and valuation. Those manufacturers can furnish others with animal matter at market prices and make a handsome profit. He can use the animal matter in his own fertilizers, and, by the saving of this one profit, can defy competition.

On the other hand, we have found manufacturers who were striving to do an honest business, but, from a want of proper knowledge of chemicals and the laws which govern chemical affinities, were actually spoiling a good fertilizer, made at considerable expense by the after-use of improper material. After making a certain proportion of phosphoric acid in bone and rock soluble, they added a "filler" which neutralized the work already accomplished by the acid, and the test of our chemist gave the resulting fertilizer a commercial value much below the *actual cost* of the leading ingredients. As a natural result, we had a manufacturer who at once claimed that that valuation was a snare and deceit, and it was only by accident that the cause of the difficulty was detected and remedied.

The reader who has followed us through our argument will readily see that the figures in our column of "commercial value" cannot be taken as an exact measure of the *cost* of the fertilizer and that the reasons for this are beyond our control and may be thus consolidated. No two manufacturers pay the same price (exactly) for the same ingredient—the one who buys in large amounts for cash has the double advantage which cash and large purchases give in any business; some have special sources which in some cases reduce the actual cost to zero; some fail from a want of a proper knowledge of their business; some are satisfied with small profits and large sales, while others ask higher prices and are content with more limited sales. These are all items over which we have no control, and hence, to avoid difficulty, we retain a fixed valuation for the whole year.

During previous years, we have given, side by side with that of commercial value, a column showing the selling price per ton at the point of selection, and some of our correspondents, even among manufacturers, have found fault with the omission. We have decided to omit this column for several reasons, among which we may enumerate the following: The selling price is not under the control of the manufacturer, but is exclusively controlled by the agent who retails the goods to the consumer. An agent buys a thousand tons of the manufacturer and may ask his own price for it, the only obligation attending the sale being that the manufacturer guarantees not to sell to the consumer at prices below those paid by the dealer. As an instance: in selecting samples we found an article of bone (not sold as pure) selling at the manufactory (retail) at twenty-five dollars per ton. We found the same brand selling at a point one hundred miles from the factory for forty dollars per ton, and at a point one hundred miles *further* from the factory, for thirty dollars per ton. In the two latter cases, the agent controlled the price, and one sold the goods as pure bone while the other did not. To adopt either of these as the figures for our column of "selling price" would mislead the purchaser and do injustice to the manufacturer. Owing to an unexpected fall in the prices of fertilizers,

we have found the same brand (taken from the same pile) selling in the same town at prices varying three dollars per ton. To assume either of these would do injustice to both of the interested parties. Owing to competition in one case, and its absence in the other, we have found goods selling in the Cumberland Valley for three dollars less per ton than over the mountain, only ten or twelve miles off. We have found a given fertilizer selling at a point one hundred and fifty miles from the factory at nearly three dollars less per ton than was asked for it at the factory. In view of these and other facts which might be noted, we have assumed that the purchaser can always tell what a given brand will cost him, and that, if in addition to this, our lists give him the comparative value of this brand, we are fully meeting the requirements of the law, which was designed to protect both consumer and manufacturer.

In conclusion, we would wish to impress upon the minds of those who receive our fertilizer lists the fact that the "commercial value," as given therein, represents the market value of the ingredients in an unmixed state, and hence the fact that a given fertilizer is rated at two or three dollars below the selling price does not prove fraud on the part of the manufacturer; but if, by comparison, its commercial value falls below that of other goods by other manufacturers, it proves that the latter have special facilities for the purchase of manufacture of supplies not possessed by the less fortunate manufacturer. We would also deprecate the theory that, as a class, the manufacturers of fertilizers are always on the lookout to overreach the consumer and furnish the lowest possible grade of goods for the highest possible price. This is not "business," and the fertilizer trade is governed by the same rules as other trades; fraud will not succeed there any better than elsewhere, and many fertilizer firms are as jealous of their business reputation as men in any other business. Notwithstanding this, we will admit that our lists of analyses prove that fraudulent goods are put on the market, but, at the same time, the returns of our manufacturers, made under oath or affirmation in accordance with law, show plainly that these goods in the end do not pay, and are soon crowded out of the market entirely, and their places supplied by articles which give the consumer much nearer value for his outlay. Several such frauds have been forced from the market by our lists of analyses, and more must follow until the market is purged of them entirely.

As closely allied to, and following the general question of fertilizer analyses, we find a scarcely less important one taking the following form:

IS CHEMICAL ANALYSES A RELIABLE TEST?

During the past year, a combination of circumstances has called our attention to the solution of this question, and, opportunity being offered, it was decided to give the matter as complete and impartial a test as possible. It was well known that there were two methods recognized among chemists, and that one or more conventions had been held for the express purpose of harmonizing the two plans. It was also well known that while these conventions were, to a certain extent, successful, yet a number still retained the older method and discarded that known as the "Improved Method." Such being the case, we were forced to conclude that the question at issue was more one of method than of exactness, and that the one which gave the highest results was practiced by these chemists who made analyses for the manufacturer, and the lower method by the chemists of experiment stations, who more closely represent the interests of the consumers. It is not our province to decide where doctors disagree, but it was our wish to

ascertain whether the science was sufficiently exact to furnish us with a safe guide to the value or chemical composition of a fertilizer. The President of the National Fertilizer Association (an association of manufacturers) had asserted in his annual address that this guide was not a safe one, and that the laws of nineteen States being founded upon it were oppressive and unreliable, because of the utter unreliability of the whole system of analyses.

Our Board had just made a change in chemists, and had practically changed its system of analyses from the plan giving the highest results to that known as the "Old Method," giving lower results.

A comparison of the analyses of the same brand and by the two chemists exhibited apparent discrepancies which fault-finders were not slow to take hold of, and use as an argument to prove the asserted unreliability of chemical analyses. These, and other items which might be noted, all seemed to point to the desirability of a test which should, if possible, decide as to the exactness of the work.

A carefully selected sample of acidulated S. C. rock, drawn from a large pile, was ground in a mortar, in order to secure uniformity in the whole sample, and divided between six of the leading chemists of this and other States. Sealed samples were sent to the leading chemists of Pennsylvania, Connecticut, Massachusetts, Maryland, New Jersey, and Delaware. Two (including the chemist of the Board) were selected from Pennsylvania, and no one of the number knew that the test was in progress. Care was taken, in all cases, to select such chemists as made the analysis of fertilizers a specialty. Nothing was said about method, but each one was expected to adopt his own method and plans of analysis. In all cases, the valuation was added after the analysis was reported, and all are based upon the same rates. The result of the test, reduced to a water free basis, is as follows:

CHEMIST.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Available phosphoric acid.	Commercial value per ton.
No. 1,	9.11	4.79	2.42	16.32	13.90	$29 01
No. 2,	9.98	1.55	4.81	16.34	11.53	27 02
No. 3,	10.13	2.26	4.00	16.39	12.39	28 09
No. 4,	10.10	3.53	2.89	16.37	13.68	29 53
No. 5,	9.89	4.19	2.25	16.33	14.08	29 68
No. 6,	9.82	4.29	1.89	16.00	14.11	29 46
Average,	9.84	3.44	3.04	16.29	13.28	$28 78

After the test had been completed, it was found that chemists number one, four, five, and six followed the same method, or that usually adopted by manufacturers; while numbers two and three followed the method giving lower results. Circumstances prevented the New Jersey chemist from giving the resut of his sample, hence we were confined to six samples. In order to carry the test still further, a sample was taken from another lot of goods and divided between chemists numbers two and three, with the following result:

CHEMIST.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Available phosphoric acid.	Commercial value per ton.
No. 3, ...	9.95	2.15	4.03	16.13	12.10	$27 47
No. 4, ...	9.58	2.76	3.82	16.16	12.34	27 50
Average, ...	9.76	2.45	3.92	16.14	12.22	$27 48

It will be noted that in the first six analyses, even though different methods were used, the amounts of "total phosphoric acid" are as nearly alike as the most inveterate fault-finder could expect, and that the variation is in the column of reverted phosphoric acid. This term is used to designate that portion of phosphoric acid which, though not strictly soluble at the time, is supposed to become so by the action of the soil, and it would seem that the whole matter turns upon a difference of opinion as to the action of the soil, or rather upon the percentage which thus becomes available.

Which of the two schools of chemistry is right we have not attempted to determine, but it would seem that, for the purpose of arriving at a valuation of a fertilizer, either are sufficiently exact and for the purpose of *comparison* it matters little which is selected, provided the same method is adhered to all through the comparison. Whether one obtains the reverted phosphoric acid at a higher or lower temperature is not so much a matter of importance as that the plan pursued shall be uniform.

We consider that our tests have proven that, when chemists of good repute follow the same method, their results are much more accurate than some have claimed and that, for the purpose of a legal test, they are all that need be required.

WHAT FERTILIZER TO BUY, AND WHY?

Of the many inquiries which, from time to time, reach the office of the Board, and to which definite answers are expected, but few come with greater frequency than that of "What fertilizer shall I buy?" Occasionally, it is varied to "What is the most economical fertilizer in the market?" but by far the larger portion of our correspondents use the first form of the question. Without any further data, it is usually expected that we will give an immediate and definite answer.

As the question is usually presented, we have no guide as to the crop, nature of the soil, or situation of the correspondent, and our answers must necessarily be general and unsatisfactory. If compelled to answer in general term, we would unhesitatingly recommend pure raw bone, or raw bone and potash, and we would do it upon the theory that raw bone suits all soils and all crops. As a substitute, where more rapid action is required, dissolved bone (pure bone and acid only) may be used. The farmer who applies ground bone to his oat crop, and looks to the result upon that crop for profit, will, in most cases, be disappointed. Its action is too slow for a crop which perfects its growth in so short a time. Our own experience is that the most economical fertilizer for all crops and for all soils is the pure bone and acid, or what is known to the trade as "pure dissolved

bone." It should contain nothing but the bone and acid, although for certain soils the addition of a small percentage of potash would be an advantage, but this can be more economically purchased in a separate form, and either mixed by the consumer or applied separately. The addition of the acid merely renders the bone more readily soluble and available for the needs of the crop. It adds nothing to the fertilizer, and hence the comparison between the action of ground bone and of dissolved bone is but a question of time; both should give the same total result, the one simply requiring more time to produce a given result. The action of bone depends somewhat upon the season, being much more satisfactory and rapid in the presence of abundance of moisture, and scarcely perceptible in a very dry season.

A number of our correspondents have furnished us with the results of experiments which seem to have demonstrated the special value of certain fertilizers. We do not doubt the honesty of the persons who conducted these experiments, but our own experience and observation has led us to doubt the value of this class of tests—the result so much depends upon peculiarities of season, and upon seemingly small things, which the experimenter does not take into account. The fact that a certain fertilizer applied to one field gave a certain result while an adjoining land to which it was not applied gave certain other results, to our mind does not necessarily prove anything. No two lands in any field will give the same result under the same treatment. An acre may be divided into eighths, and to seven of these seven different fertilizers may be applied, and with noted results as compared with the remaining eighth to which nothing was applied, but it will not do to accept these results as final, for a repetition of the experiment on adjoining lands or acres, the next season, may give very different results; or if an adjoining acre is in the same manner divided into eight portions and nothing applied to any of the portions, a comparison of the actual crops will show as great a variation as in the first experiment, thus showing that such experiments are not to be relied upon in fixing results and facts. A's fertilizer, during a wet season, may give certain results, but the next year, being dry, will probably disappoint the farmer who has pinned his faith to the result of the first application. Next, a very poor fertilizer may be applied to the soil and produce excellent results, not from its own action, but from the unexpended action of the first application. The point which each farmer is most interested in ascertaining is whether his soil needs phosphoric acid, potash, or nitrogen, or whether a mixture of two or more of these elements will give the best results. It is not so much a question of the comparative value of A and B's fertilizer as it is a question of the comparative action of the elements which form the valuable portion of all fertilizers. By following up this course of experiment, we have satisfied ourselves that pure raw bone or dissolved *animal* bone will give the best results upon our land, and, hence, we consider it to be the most economical.

Having decided this much, the rest would seem plain, for we find plenty of bone in the market, and much of it guaranteed to be pure. To many, the term "bone" conveys but one idea, viz: the bones of animals ground to a powder. This is correct, so far as it goes, but the difference in the price of the different brands of bone should convince the purchaser that there must, necessarily, be some difference in quality and value. We find on the market a variety of brands known as "soluble bone," "dissolved bone," and "acidulated bone," which in reality do not contain an ounce of animal bone to the ton, but which are South Carolina rock treated with acid, which is a good fertilizer for some soils and crops, but is not the "bone"

we are looking for. Discarding these and confining ourselves to "pure animal bone," we will still find a variation of ten dollars per ton in the price of the article guaranteed by reliable parties to be pure animal bone. This difference in price leads to the inference that there is some difference in quality and value, and a careful examination will show that in many cases this difference in action and actual value is even greater than the difference in price.

The highest-priced bone on the market is what is known to the trade as "button bone," or the refuse of button factories, where bone buttons and bone ornaments are made. This, if free from the turnings of vegetable ivory, constitutes the grade which will run highest in phosphoric acid of all the brands. This grade usually sells at from forty dollars to forty-five dollars per ton.

The next grade is taken from what may be termed "the run of the bone," or, in other words, is made from bones from which the hardest bones have *not* been selected for buttons. It is the run of the bone as they come from the animal, and is what should be insisted on when pure raw bone is purchased.

A third grade is made from bones from which all the harder portions have been selected for buttons and other similar work. This grade can be sold at a lower rate, for two reasons: first, the removal of the hard bones at an advanced price has reduced the cost of the remainder, and second, the bones, being softer, are not so expensive to grind.

A close examination of the market would probably demonstrate the fact that perfectly pure animal bone (that is, nothing but ground animal bones) can be purchased at prices ranging from twenty-eight to forty-five dollars per ton, and analyses will probably demonstrate that the higher-priced are the cheapest and most economical for the consumer.

When we leave the three or four grades of perfectly pure bone, we are at sea among adulterations of all kinds and all degrees, and if we take our "raw-bone phosphates" into the list, we will find them varying from an honest article which derives all of its phosphoric acid from animal bone to others which have not a single pound of animal bone in their composition; but one rule we find to nearly hold good, viz: the greater the adulteration the greater the profit. At the present prices of unground and ground bone there is but little profit in the second grade to which we have alluded, (the run of the pile,) but as we go downward in the scale of separation and adulteration the profit to the manufacturer increases.

To prevent misunderstanding, we would say that we have no wish or intention of being understood to assert that the brands of "soluble bone," "dissolved bone," and "acidulated bone" are not valuable, but we do not think it fair that the pure animal bone should be held responsible for their shortcomings and defects in plant nutrition. The name is given them for the purpose of selling them on the superior credit of animal bone and for no other purpose. They can be furnished at a much lower price and at the same time afford the manufacturer more profit, but do not furnish the same elements in the same proportions.

At the present time, the most serious drawback (to both manufacturer and consumer) is to be found in the foolish rage for low-priced fertilizers: Ground limestone at eight dollars per ton, the refuse of salt works at twelve dollars per ton and dear at fifty cents, raw South Carolina rock (not acidulated) at eight to ten dollars per ton, the refuse of alum works at twelve dollars per ton, (and in large amounts positively injurious to land and crop,) New Jersey marl at ten dollars per ton, with not enough *soluble* potash to pay the freight, and marl and common lime mixed and sold under misleading

names, all find by far too many purchasers, who appear to mistake bulk for quality and with whom low price is synonymous with cheapness. The same farmer, when starting out to purchase a horse, would not look for the lowest priced one which he could find, but would take the animal which he considered the cheapest for the price asked. Let us apply the same rule to the purchase of fertilizers and it will not lead us astray. We want a given result for the lowest possible outlay, and (provided we get the result needed) the smaller the bulk handled the better, for we may thus save both freight and labor.

Other things being equal, *we find that there is most fraud in the lower-priced and least in the higher-priced fertilizers*, which (in most cases) the manufacturers keep up to the former standard. Many of our manufacturers having established the reputation of their standard brands will not reduce them to suit the demand for lower-priced articles, but still keep them up to the same guaranteed analysis. In some cases we might name, and in more that are suspected, a lower grade has been made by mixing cheap "fillers" with the standard goods, to reduce the price per ton to a point which will satisfy the market demand, but our analyses prove that in many cases the purchaser pays dearly for the reduction, and that the profits of the manufacturer are as great *per ton* on the lower-priced goods. We might instance the case of a high-priced fertilizer placed on the market at a price which, at the time, made it the cheapest source of phosphoric acid offered. Failing to make any sale, the manufacturer mixed two tons of a cheap "filler" with each ton of the fertilizer, and, by offering the mixture for one half of the original price, obtained one hundred and eighty dollars for what he had previously asked but one hundred and twenty dollars for and had nothing of value in it.

It is safest to buy only of reliable parties, upon the guarantee that the goods are as represented, and buy good goods only. If the farmer wants soluble phosphoric acid, he will find that it is cheaper per pound in the high-grade articles, and dearest in those of low grade, and the same argument will hold good as to potash and nitrogen, either alone or mixed together. An article of acidulated South Carolina rock guaranteed to twelve per cent. soluble, will give the purchaser but two hundred and forty pounds of soluble phosphoric acid per ton, mixed with seventeen hundred and sixty pounds of comparatively valueless material, while a twenty-four per cent. article would furnish twice as much per ton, and would thus save the handling and freight on one ton, and at the same time probably cost less per pound. We should first make up our minds as to what we want in a fertilizer, and, having decided upon this, buy the one which will give the largest amount of the material wanted for the least outlay.

To summarize: The consumer must first decide what he wants in the fertilizer which he intends to make use of. He can make his choice from the three elements, (phosphoric acid, potash, and ammonia.) or he may have any mixture of any two or of all three. If he decides from analogy or experiment that phosphoric acid will give him the best results, he may make his choice between pure bone and acidulated South Carolina rock. In making this choice, the main item to influence him is the comparative rapidity of action, the bone requiring more time than the rock. If he decides in favor of the South Carolina rock, he will then want the brand which will give him the largest number of pounds of "available" phosphoric acid for the least money. The cost per ton is not a material item in making the selection, for it is possible for a thirty-dollar article to furnish available acid at a less rate *per pound* than one selling for but seventeen dollars. If he decides upon potash as the one ingredient wanted, he may

compare kanite with the numerous forms of commercial potash, and we think that, as a rule, he will find that if purchased upon the guarantee of a reliable firm, the commercial forms are the cheapest, and are far more likely to be up to the guarantee. If wood-ashes can be purchased at a reasonable price, it is often the most economical source of this element. If he decides upon nitrogen, (ammonia,) he may take his choice among the guanos, and long list of ammoniacal compounds used by manufacturers. If he can secure a good article of raw bone, he will (in combination with phosphoric acid) obtain the nitrogen (ammonia) in one of its most economical forms. If he decides upon a mixed fertilizer, (as nine tenths will do,) he should first arrive at some conclusion as to the relative proportions which he wants, and buy the fertilizer which comes nearest to his requirements. It is a waste of money for him to purchase a fertilizer which contains an excess of an ingredient which he does not need, and which he does not wish to purchase. To reduce our advice to the smallest possible number of words: make up your mind to just what you want, and then buy it, and it only, in as pure a form as is consistent with economy.

A number of our correspondents have asked our advice as to the economy of purchasing the chemicals, and mixing their own fertilizers. To such inquiries we have to reply that we fail to see how it is more economical. It is true that the consumer can claim that he knows just what goes into the fertilizer, and in just what proportions, but we fail to see how this claim can be supported, for, *if* he knows just what he puts in it is because he depends upon the guarantee or assertion of the person from whom he buys the materials, and we fail to see any advantage this gives him. If he must depend upon the honesty of the dealer for the composition of each of three or four ingredients, he may as well depend upon this honesty for the composition of the mixture. The opportunity for fraud is as wide with each of the ingredients as it is with the mixture. All will admit that a manufacturer, with proper facilities, can mix one thousand tons much more cheaply (from the same ingredients) than the farmer can mix one or two tons on his barn floor, and, at the same time, do it much better and completely. One of our correspondents, in reply, claims that the manufacturer may add coal dust or some cheap material to the mixture; but to this our reply is that he may just as readily adulterate any one or all of the ingredients and reach the same end.

IMITATION BUTTER AND CHEESE.

Every year since its organization, our Board has had its attention more or less directed to the effect of the competition of artificial butter upon the legitimate products of the dairy, and, during the first year of its organization, an act to regulate the manufacture and sale of such goods was drafted by the Secretary, and, after repeated discussion by the Board and the agricultural organizations of the State, was presented to the Legislature of 1879, with the indorsement of the Board, and became a law of the Commonwealth with but one dissenting vote. This act was drawn with much care and was the result of consultation with some of the best lawyers of the State, and had the full approval of the Attorney General (Hon. George Lear.) It was so worded as to avoid all constitutional objections, and yet, at the same time, afford all the protection afforded by the Constitution. Inasmuch as our new Constitution positively forbids inspectorships these were avoided. In detail it compelled the manufacturer of oleomargarine to brand all wholesale packages, and made it the duty of retail dealers to deliver to purchasers a printed label on which was printed the word oleomargarine. As the scientific knowledge of the preparation of

these imitation compounds increased, other names were given and cheese was adulterated with foreign fatty matters. In view of these facts, it was found necessary, in 1883, to amend the act so as to include suine, butterine, and other compounds and also to make cheese, adulterated, subject to the law, but it has since been found that in making these changes certain clauses regulating the export of butter and cheese were introduced which are unconstitutional. It is well understood, however, that this only affects the law so far as export butter is concerned, and will not affect its application to such as is offered in the home market, and that thus far the provisions of the act are in full force.

In view of these and other facts which might be named, the Board has had under consideration several drafts of acts and its action thereon will be found in full in the proceedings and the reports of its committees as published elsewhere.

In the consideration of this question, the Board has found itself in a position which may readily be misunderstood and mistaken by the casual observer. It has been claimed by some that it is its duty to favor the most stringent act, even to the prohibition of the manufacture of these compounds, and that nothing short of this will remedy the evil; but we are compelled to look upon the matter in all of its bearings, and to well consider each step before it is taken. We may readily go too fast and be placed in a position where retraction becomes very difficult, and where a single misstep will leave affairs in a worse condition than they now are; an unconstitutional law, or one which cannot be enforced, is worse than no law at all, and such an act would only place our dairymen more at the mercy of this competition.

First. As to the nature of the competition complained of, does the presence of these imitations in the market seriously affect the price of *first-class* butter? Or does it only interfere with the sale of the lower grades? That butter is low, and that it has been too low for profit, are facts which cannot be denied, but may not at least a portion of this be due to over-production? The figures show that we have increased the number of our cows and our supply of milk and butter much faster than we have our consuming class. Compare the amount of butter, cheese, and milk produced within a circle of forty miles around Philadelphia with that of the same area twenty years ago, and then compare this ratio of increase with that of our increase in population, and we will find abundant reason to account for a low price of butter without the manufacture of the imitation article. Again, laying aside the feeling which our Board naturally has against anything which actually does, or is even supposed to, affect the pecuniary interests of farmers, and considering the matter from the same stand-point as our Legislature must and will consider it, are we justified in asking for an act which prohibits the manufacture of an article simply because it is a competitor which injures our business? Laying all constitutional objections aside, can we, as farmers, go before the Legislature and ask it to pass a certain act simply because we cannot stand before the competition of that article? Or admitting, for argument's sake, that we are justified in prohibiting the manufacture of the article in the State, and that the Constitution will bear us out in so doing, what would be the result? Would not the article then be made outside of the State, and we then be compelled to regulate its sale within our borders? Throwing all constitutional questions aside, we do not see how an act prohibiting the manufacture of this class of goods, even if enforced, can permanently relieve our dairy interest. We are suffering from over-production in this as well as in all other branches of our calling, and

even if the manufacture of imitation goods was stopped, we doubt if the good results in raising prices would be of long duration.

It is urged against this that New York has passed a law prohibiting the manufacture of imitation butters, but, unlike our State, New York has not a constitution which forbids the appointment of inspectors, and her law carries with it the power to enforce it by rigid inspection, which is practically in the hands of the dairy interests of the State. This, Pennsylvania cannot have, and, without it, we fear that the most rigid prohibitory imitation butter law would be an utter failure, and leave our dairy interests in a worse position than at present. The presence of an inoperative law upon our statute books would only make matters worse and place the dairy interest still more in the power of its enemies.

What, then, is the limit of proper State action in relation to this subject? We think that all we can properly and justly ask of the Legislature, and all we will be likely to get, no matter what we ask, is that the manufacture of oleomargarine, suine, butterine, &c., shall be compelled to sell them for what they are and for nothing else. The provisions of the act should be such that the purchaser who wants butter will be protected against the fraud of the imitation article, and that those who want the low-priced and imitation article may be able to buy it at the lowest price at which the manufacturers are willing to sell it. Compel its sale upon its own merits, and we will have done all that will stand the test of law and of justice. More will only weaken our cause. Our farmers have never been afraid of fair and open competition, and our dairymen (as farmers) do not fear it now. Compel the sale of the genuine and imitation articles upon their own merits, and, if the imitation is the best and cheapest, we must try something else.

In considering the legal bearings of the case from an entirely disinterested standpoint, we should not lose sight of the fact brought to your attention at the Lock Haven meeting, viz: The responsibility of the dealer in such imitations under the common law. If a purchaser is furnished with suine or butterine when he pays for butter and is thereby defrauded or injured, he has a remedy under the common law.

The limited space at our disposal forbids the introduction of the laws of States in full, but for the purpose of comparison and information, we here introduce an abstract of the leading and most important laws bearing upon this product.

New York.

Section first provides that any person selling unclean, impure, unhealthy, adulterated, or unwholesome milk, or articles of food made from such milk, shall be punished by a fine of from twenty-five to two hundred dollars, or six months' imprisonment, or both, at the option of the court.

Section second provides that no person shall keep cows in crowded or unhealthy stables, feed unhealthy food, or manufacture any article of food from such milk, under a penalty equal to that of section first.

Section third provides that no person shall bring to any butter or cheese factory any milk diluted with water, adulterated, unclean, impure, or unwholesome milk, or from which the cream has been removed, (except for skim milk cheese,) or who shall keep back any strippings, or who shall supply sour milk, or any butter or cheese factory which shall use such milk shall be punished by the same amount of fine and imprisonment.

Section fourth provides that no manufacturer of butter in packages shall sell it in unstamped vessels, and that the stamp must be of legible letters at least one fourth of an inch long; penalty for a violation, from fifty to one hundred dollars' fine, or two to four months' imprisonment, or both.

Section fifth provides that no person shall sell (except in the county in which it is produced) any milk except in cans, vessels, or packages "durably and distinctly marked and branded with letters not less than one inch in length and above the center of every can, vessel, or package containing such milk, the name of the county from which the same is produced." It also provides that the same marks shall be on the vehicle from which it is sold. The penalty for a violation is a fine of from twenty-five to two hundred dollars, and imprisonment of from two to four months, or both.

Section sixth provides that no person shall manufacture "any oleaginous substance or substances or compounds of the same, other than produced from milk or cream from the same, any article designed to take the place of butter or cheese produced from pure unadulterated milk or cream from the same, or shall sell, or offer for sale, the same as an article of food." This section makes an exception in favor of skim milk cheese, and imposes a penalty of from $100 to $500, or one year's imprisonment, or both, for any violation.

Section seventh provides that any one selling butter or cheese falsely labelled shall be subject to a fine of from twenty-five dollars to fifty dollars, with imprisonment for a second offense.

Section eighth provides that all condensed milk shall be made from pure milk only and be plainly labelled and in air-tight packages; any violation to be punished by a fine of from fifty dollars to five hundred dollars and imprisonment of six months, or both.

Section ninth authorizes the Governor to appoint a dairy commissioner, with a salary of $3,000 per annum, whose duty it shall be to enforce the provisions of the act. This section also appropriates the sum of $30,000 for the expenses of the commissioner.

Section tenth gives the commissioner free access to all buildings, cans, &c., and power to compel the opening of any package, can, or parcel, for the purpose of investigation.

Section eleventh gives certain courts jurisdiction over all cases arising under the law.

Section twelfth applies all fines to assist in the payment of costs, all deficiencies therein to be paid by the State.

Section thirteenth provides that all milk showing more than eighty-eight per cent. of water or less than three per cent. of fat, or from a cow within fifteen days of calving or five days after calving, or cows fed on distillery slops, or any substance in the state of putrefaction or fermentation, shall be deemed as unclean and form improper food, provided that the section shall not prevent the feeding of ensilage.

Section fourteenth provides "That the doing of anything prohibited being done, and the not doing of anything directed to be done by this act shall be presumptive evidence of a willful intent to violate the different sections and provisions hereof."

Section fifteenth repeals certain acts and parts of acts conflicting with the law, and section sixteenth provides that the act shall go into effect on the first day of June, 1884.

Maryland.

Section first provides that every person who offers or exposes any substance in the semblance of butter or cheese which is not wholly made from milk or cream shall brand each package with the word "Oleomargarine" in letters not less than half an inch long, and that each retailer shall give to the purchaser of each package or parcel a printed card or label bearing the same word and in letters of the same size.

Section second, that any one offering or selling imitation butter or cheese not properly branded or stamped, or without delivering the proper label, shall be punished by a fine of one hundred dollars, one half of which shall be for the use of the informer.

Section third provides an additional penalty in the form of imprisonment of from ten to ninety days.

Section fourth authorizes the confiscation of goods sold in violation of the provisions of the act.

Section fifth authorizes the city of Baltimore to enforce the act by proper ordinances.

Missouri.

The act of this State (which has been pronounced constitutional) is essentially section sixth of the New York law.

Vermont.

Section first provides that all packages in which imitation butter is packed, or from which it is sold shall be stamped with the word "oleomargarine" in letters not less than half an inch long, and that every retailer of this class of goods shall deliver to the purchaser a written or printed label bearing the word "oleomargarine," with every package or parcel.

Section second imposes a penalty, for a violation of either of these provisions, of twenty dollars, and that proof of sale shall constitute presumptive evidence of guilt.

Section third makes the act effective from and after its passage.

Two acts have been introduced into the Legislature of Vermont, one of which, by Mr. Parker, provides, by section first, that every manufacturer of "oleomargarine and other substitutes for butter," shall make monthly return, under oath, of the number of pounds manufactured, and if the amount returned varies ten per cent. or more from the exact amount made, the manufacturer is subjected to a fine of five hundred dollars. Section second provides that every manufacturer shall pay a royalty or fine of fifteen cents per pound upon every pound manufactured if this amount is notpaid on or before the 15th day of the succeeding month, power is given to collect as other defaulting taxes are collected. Section third provides that every manufacturer shall take out an annual license, for which he shall pay the sum of $10,000, and that every retailer shall take out a similar annual license, for which he shall pay a license fee of $2,000 and that any one selling without license shall be fined $500.

A second act, introduced by Mr. Child, provides for a revision of the act now in force (as first named in this article) by the insertion of the words "one half of the fine to be paid to the informer."

A review of these and other acts shows that we may adopt one of two courses of action, viz: prohibitory and restrictive. In the adoption of prohibitory legislation the question of constitutionality must be taken into consideration. The act of Missouri, which is prohibitory in its provisions, has been pronounced constitutional, while the act of Maryland, which is only restrictive, has been decided to be unconstitutional. The act of New York at this date (November 1) is in the courts of that State for adjudication.

Under our State Constitution it would seem that the appointment of a State inspector or commissioner is unconstitutional, and, if so, it is a grave question for the consideration of the Board whether a prohibitory act with no special duty upon any one for its enforcement will prove any more satisfactory in its results than a restriction act, the weakness of which is,

that it is the special duty of no one to enforce it. In a consideration of the three acts which have been presented for your consideration, you will have a representation of the two forms, with the addition of another based upon the same principal as our fertilizer act. This latter form of act assumes (which is not proven) that chemical science has reached a point from which the chemist can tell us exactly how much of a given sample of imitation butter is tallow and how much is the natural product of the cow. The chemist of the Board has informed you that chemical science has not yet reached a point which will enable them to do this, and hence we doubt the value or efficiency of this form of legislation when applied to imitation butter or cheese. The fact that such an act operates satisfactorily when applied to fertilizers, the composition of which is known, or which can be ascertained by analyses, by no means prove that its application will give equal benefit when applied to imitation butters whose composition is hidden and almost impossible to properly determine. It would then seem that in our consideration of the topic, we must first decide whether we will ask the Legislature for prohibitory legislation, or whether we will confine ourselves, as in the past, to restrictive laws and provisions. If the former is adopted as the proper and best course, some means of enforcing the desired legislation not at variance with our State Constitution should be devised, for the experience of the past teaches the lesson that prohibitory legislation not properly enforced is of little or no benefit to the parties to be assisted by it.

LUNG PLAGUE OR CONTAGIOUS PLEURO-PNEUMONIA.

During the past year, the Secretary of the Board (as the special agent of the Governor) has been engaged in preventing the spread of this disease from all infected centers, and, in the enforcement of the act of May 1, 1879, for the suppression of the disease. The close of the preceding year left us with a center of infection near West Chester, which was the result of the introduction of infected stock coming from or through Baltimore. Since the commencement of the present year, we have had two new outbreaks; one in Montgomery county near Wynnewood, and the other in Lancaster county near Marietta. The source of infection in Lancaster county was due to the introduction of cows from the South coming through Baltimore. Two herds were infected by the purchase of animals from the same lot of cattle, but the infection was kept in check and did not spread to any adjoining herds. The original infection in Chester county had been confined to three herds (Nos. 84, 86, and 88.) It was prevented from spreading from herds Nos. 84 and 86, but, by the failure to report, its existence in No. 88 permitted its spread before the State officers took charge, and the work of controlling and suppressing the disease was very much increased. But for this failure to give an early report, the work of the present year would have been light, and the State would have been much sooner free from the disease. Having once escaped from herd No. 88 to three or four neighboring herds, it became very difficult to control, but, throughout all of the work, the State officers were cordially assisted by the owners and citizens of the surrounding district. In the case of one of the Lancaster county herds, the surrounding property owners submitted to the closing of a public road which interfered with the isolation of the diseased stock. The owner of herd No. 84 spared neither expense nor trouble in assisting the officers, and, finally, killed the remainder of his herd in order to prevent a possible second outbreak. All animals sound and fit for beef were promptly slaughtered by the owner and the carcases sent to market, and all diseased animals were properly condemned in accordance with the provisions of the act of 1879,

and killed. By this course, the owner lessened the loss to himself, and to the State also, and cleared the farm from the disease much sooner than by any other plan that could have been pursued. The owner of herd No. 86 also gave the State officers all the assistance in his power, and the disease was not allowed to extend to other stock. In herd No. 88, the owner, having been pursuaded that the disease was not that of lung plague and that it would yield to medical treatment, permitted this treatment to go on until his herd was completely infected, and the disease, also, carried to neighboring farms. Through a defect in the law, the owner purchased more stock before the quarantine was removed, and the disease once communicated to the newly-purchased animals was retained on the farm for a much longer period. The infection from this herd having spread to others, and the center having finally been reduced to one herd, a meeting of the neighboring stock-owners was called, and it was decided that, for the protection of the live stock of the neighborhood, all the remaining animals should be killed. Those in good health were slaughtered on the farm and their carcases sent to market, and all infected or diseased animals killed and the carcases buried under quick lime. By this vigorous treatment, it is believed that the disease has been conquered and the State again freed from the contagion. It is a matter of pride with the officers having the work in charge that in each and every case, not only during the past year, but, also, during the six years in which they have been engaged in the work, they have had the cordial coöperation of the owners of all infected herds, and, also, of adjoining stock-owners, and that their labor has thus not only been lightened, but has, also, had its most unpleasant feature removed.

The expenses of the work during the past year have been $3,179 74, which may be itemized as follows:

Amount paid for animals condemned and killed, ...	$1,491 00
Amount paid veterinary surgeons on account of per diem and expenses, ...	644 20
Salary and traveling expenses of Governor's agent, . . .	825 00
Office expenses, pay of appraisers, telegrams, and all incidentals, ...	219 54
	$3,179 74

As will be noted, the main item is for animals condemned and killed; the payment (promptly) for all such animals is one of the main causes of the success of the officers in eradicating the disease. If the owners know that they will receive no pay from the State, they will not only not report the disease, but will often ship them to market and thus spread the infection to other points as numerous as the animals of the herd. The prompt payment (partial) for all animals condemned has secured the coöperation of all interested parties; at least three fourths of the expense of veterinary surgeons, and no small part of the traveling expenses of the Governor's agent, have been due to the investigation of cases reported by the owners, but which proved on examination to be tuberculosis, or other disease of which the law takes no cognizance. As soon as the first post mortem establishes the existence of the infection, the whole herd is appraised by disinterested parties, under oath, and, in case of the condemnation of the animal, one half of this price is paid promptly. This only applies to animals which were sound at the time of the first visit of the State officers. All animals found infected at that time are valued at a mere nominal price and promptly slaughtered. The effect of this plan has, in all cases, been to induce the early reporting of infection and thus the work of suppression is

much lessened. So far as known, no case of the disease is to be found in the State, and we may expect entire freedom from its ravage until infected stock is brought in from other States.

The experience of the past year has fully confirmed the fact that, in most cases, it would be more economical for both the State and owner if the sound animals were at once slaughtered and the carcases marketed before they become diseased. As the law now is the State officers have no power to order the killing of a well animal, no matter how much it may have been exposed to contagion, but they must wait until it becomes diseased and worthless before killing it. In very many cases, the prompt killing of all the herd would have saved the owner the loss of one half of the value of many animals. Another weak point in our present law, and one which has cost some of our stock-owners considerable money, is to be found in the fact that the owner of an infected herd may, at any time, purchase an animal to replace his loss, and, may, in this way, prolong the infection indefinitely. In one case, suit was commenced and damages recovered from the owner of an infected herd, who, by the purchase of animals before his release from quarantine, caused a fresh out-break in his herd, during the prevalence of which the herd of the neighbor was infected.

If properly protected from infection from outside sources, there need be no difficulty in keeping the State free from this disease, and all cases brought under our care for two or three years past were due to the disease having been brought into the State by cattle from other localities.

FERTILITY, SOIL EXHAUSTION, AND FERTILIZERS.

By Professor W. H. JORDAN, *Chemist of the Board.*

It has been my fortune, especially during the past year, to receive a great many inquiries from farmers in Pennsylvania about soil "exhaustion," "commercial fertilizers," and allied topics. These are subjects that I have discussed before this Board repeatedly and at length. In spite of this fact, I shall beg the privilege of discussing, at this time, the following questions:

(1) What constitutes fertility?

(2.) What is soil exhaustion as commonly understood by practice?

(3) What are, to-day, our cheapest sources of plant food?

I have chosen these topics because they are those about which, according to my observation, farmers ask questions and discuss more than about almost any others; and, besides, I shall endeavor to make a portion of this paper something more than a mere repetition of what I have said on previous occasions. You know that every important principle or fact in agriculture has many phases, or points of application, and it is not easy to exhaust such subjects as are mentioned above, when we consider them in their practical relations. I trust, therefore, that you will pardon what may seem in me to be a tendency to "ride a hobby."

The first question is, "What constitutes fertility?" We say in general that a soil is fertile when it produces abundant crops. When asked why one soil is more fertile than another, the agricultural chemist is apt to reply that one soil contains more available plant food than the other. The chemical composition of soils is often the only condition that is mentioned as accounting for differences in fertility. It is a plain fact, however, that differences in chemical composition do not explain, in all cases, the great variations in the fertility of soils. Two soils may be very much alike in composition, in the amounts they contain of the various ingredients that plants take up, but be very unlike in fertility. Chemical composition and condition are very important factors of fertility, but are not the only ones.

In seeking an answer to our question, we should bear in mind two facts:

(1.) The soil is to feed the plant.

(2.) The soil is to be a home for the roots of the plant.

In other words, we must consider the *mechanical* or physical condition of soils as well as their *chemical* condition; or again, if manure is essential to good farming, so is proper tillage. In recognizing the importance of the one, we must not forget the other.

A fertile soil must, first of all, feed the plant. In order to do this, it must contain certain amounts of certain kinds of material. Moreover, this material must be available to the plant—such as the plant can use. The material must be of a specific kind, and must be in a useful form.

The soil must feed the plant with water as well as with mineral and nitrogenous substances. The soil then that is moist without being too wet, that retains moisture at the same time that it drains properly, is fitted to furnish a constant supply of water to plants. The condition of fineness, or the manner in which a soil is pulverized, has a very great influence on its

fertility. The differences that exist between a well-pulverized limestone-clay soil and one in a coarse, lumpy condition are, in the main, as follows:

1. The finely-pulverized soil is better fitted to supply water to a crop; it can carry a crop through a much more severe drought than the coarse soil.

2. The finely-pulverized soil will give up more readily and in greater quantity the material that exists in it in an unavailable form until acted upon by the process of weathering.

3. The action of any fertilizers will be more efficient in a finely-pulverized soil.

4. As a home for the roots of plants, the finely-pulverized soil is greatly superior to the coarse one.

I have two suggestions to make in this connection: 1. Never plow land when it is too wet or too dry if it can be avoided. 2. If land must be plowed at a time when it does not pulverize, do not neglect to roll it and harrow it until it is fine.

I will not enlarge upon this topic. I have made these suggestions briefly, more for the purpose of emphasizing facts with which farmers are already familiar than with the view of presenting anything new. Moreover, I desired to define *fertility* in order to clear the ground for what isto follow.

The second question which I have proposed is this: What is soil exhaustion as understood by practice?

There are two phases of this question which I wish to discuss, viz: Soil exhaustion in general and soil exhaustion as related to particular crops. The first I shall treat briefly, and shall deal principally with the second.

Soil exhaustion is most generally due to a lack of available plant-food. It is never due to an entire absence from the soil of even one of the various kinds of material which plants take up. Enough material of which plants are built is usually present, but often not useful material. It is not necessary in order to cause soil exhaustion that there be a lack of more than one ingredient of plant-food in an available form. The failure of the plant to secure enough of one ingredient may be as fatal to its successful development as the failure to secure all the ingredients necessary to its growth.

The ingredients, one, two, or all of which are in almost every case those that crops fail to secure in sufficient abundance, are nitrogen, phosphoric acid, and potash. Consequently, we are to-day buying nitrogren, phosphoric acid, and potash.

The second phase of this question of soil exhaustion pertains to particular crops. I shall present here as a discussion of soil exhaustion by various crops an article written about two weeks ago in reply tocertain inquries.

A correspondent asks: "Is the popular opinion that buckwheat is an unusually exhausting crop to land correct; if so, is it because of the chemical composition of the plant?"

Farmers often speak of one crop as being very exhausting to the land, or as more exhausting than some other crops, as, for instance, timothy is regarded as more exhausting than clover, and the questions above open up a field of inquiry which is full of interest

The term "soil exhaustion" is often used to indicate simply the amount of material which a crop withdraws from the soil. Ordinarily, however, it has a broader significance, and is applied to the effect which one crop has upon the succeeding crop. Thus, because wheat grows better after clover than after timothy, farmers speak of timothy as more exhausting than clover, and often explain the difference by saying that timothy takes more from the soil than clover; or, in other words, it is assumed that the difference lies in the different chemical composition of the two plants.

There are several elements entering into the explanation of soil exhaus-

tion as understood in farm practice, of which chemical composition is only one, and often a minor one.

The effect of the growth of any crop upon the succeeding one is determined by the following factors:

1. The chemical composition of the crops.
2. The location in the soil from which the plant draws its food.
3. The feeding power of the plant.
4. The residue which the crop leaves behind in the soil.

(1.) There certainly is a difference in the relative amounts of several kinds of ingredients which different crops take from an acre of land. This is clearly seen by the following table:

ESTIMATED CROPS.	Pounds of nitrogen.	Pounds of phos. acid.	Pounds of potash.
Timothy hay, 2 tons,	54	28	81
Clover hay, 2 tons,	79	22	74
Potatoes, 150 bushels,	30	14	52
Sugar beets, 15 tons,	48	27	147
Wheat, 25 bushels, with straw,	43	18	24
Oats, 40 bushels, with straw,	37	16	47
Corn, 50 bushels, with straw,	57	25	51
Buckwheat, 30 bushels, with straw,	53	22	58

The continuous growing of sugar beets would remove more potash from the soil than the continuous growing of wheat. This fact has made itself felt in practice.

On the other hand, timothy has the reputation of being much more exhausting than clover, a fact not accounted for by the figures in the table. Buckwheat removes no more than corn, yet, probably, has the reputation of being more exhausting. The composition of the crop has an influence on the degree of exhaustion, but fails to explain the whole difference observed.

(2.) A plant that feeds from near the surface will, undoubtedly, produce an effect on the after fertility of the soil different from that of a plant feeding from a considerable depth, especially if the crop which is to follow is a surface feeder. A plant which draws food from the lower layers of the soil and stores part of the material thus obtained in large roots, which afterwards decay near the surface, is a much better preparation for a succeeding wheat crop than a plant feeding from near the surface. This fact, probably, explains part of the difference between the effect of timothy and that of clover.

(3.) It is well known that some crops can be grown easily and profitably on land that will fail to sustain some other crop. Buckwheat is a plant that can get its living in a very poor soil. Why? Because its feeding power is great. It is able to appropriate material that is not available to wheat or barley. Oats can also grow to a full crop where wheat cannot. Barley resembles wheat more nearly in its feeding power. Now, when wheat, for instance, follows a crop that is a real scavenger, that is able to grasp nearly the last remnants of material which is at all available, it has a hard chance. Oats are said to be exhausting, though this crop takes very little more from the soil than wheat. Has not this crop, as well as buckwheat, obtained its reputation for being exhausting simply because it is able, by its great feeding power, to reduce the fertility of a somewhat worn-out soil to a still lower point, or to a point where other grain crops of less feeding power cannot flourish?

(4.) The roots and stubble which a crop leaves behind decompose and aid

in the growth of the subsequent crop. The quantity and composition of this residue determine the extent to which it can furnish plant-food. The roots and stubble from an acre of clover are much more in quantity than the roots and stubble from timothy, and are also much richer in the important ingredients of plant-food. Wheat succeeds better on a clover than on a timothy sod, not because the timothy has removed more from the soil in the grass that was cut, but because it leaves a smaller and less efficient manurial residue in the shape of roots and stubble. It is more correct to say of timothy that it makes poorer preparation for a succeeding crop than clover does, than it is to say that it is more exhausting because it takes more out of the soil.

The third question which I proposed to discuss here is: What are today the cheapest sources of plant-food?

Not long ago, a representative of a county grange applied to me for information as to the best method of coöperating in the purchase of commercial fertilizers. I made the following reply, which I present here with a few modifications:

"Your association of farmers desires information in regard to the compounding of fertilizers, and its members propose to coöperate in the purchase of the materials necessary for that purpose. I wish to state most emphatically that this is all in the right direction. A clear understanding of a few facts will enable a farmer to compound a fertilizer that will be of any kind he may desire, and that will be the best of its kind, and we all know that coöperation in such matters is in accordance with sound business principles.

"The fertilizers in the market contain, as their valuable ingredients, nitrogen, phosphoric acid, and potash, some having one, some two, and some all three of these ingredients. There are certain standard articles in the market which contain these valuable ingredients singly. For instance, dissolved bone-black and dissolved South Carolina rock contain phosphoric acid, but no nitrogen or potash. Sulphate and muriate of potash contain only potash; while sulphate of ammonia, nitrate of soda, dried blood, &c., contain nitrogen as their only element of value. There are also in the market a great number of brands of fertilizers that contain all three of these valuable ingredients, and which are made by mixing together some of the materials mentioned above or by the use in part of certain refuse substances, such as hair and other slaughter-house refuse. It is a characteristic of many of these special brands of fertilizers that they contain too small percentages of the valuable compounds and too large a proportion of material of comparatively little value. It is different with the standard articles mentioned above.

"There are four requirements involved in the economical purchase of commercial fertilizers. Farmers should—

"*First.*—Buy what is needed.

"*Second.*—Buy in large quantities and of responsible dealers. In other words, coöperate.

"*Third.*—Buy concentrated material, and thus save freight.

"*Fourth.*—Buy material that is readily available to plants.

I will suggest a method by which the above requirements can all be met, and the use of commercial fertilizers be put upon a much more satisfactory and definite basis than is generally the case.

I will suppose that, in the county grange to which reference has been made, there are fifty farmers who wish to use an average of two tons of commercial fertilizer each, or one hundred tons in all. If the land, belonging to these farmers is like the great majority of farms in the limestone

region of central Pennsylvania, a fertilizer in which phosphoric acid is the predominating ingredient, but which contains small quantities of nitrogen and potash, is the most judicious one to purchase. This being the case, let the business agent of the grange contract with some responsible large dealer in fertilizers for five car-loads of fertilizers, to consist of the following materials: Eighty-five tons of dissolved South Carolina rock, guaranteed to contain not less than twelve per cent. of available phosphoric acid; five tons of muriate of potash, and ten tons of nitrate of soda, containing fifteen per cent. of nitrogen. These materials will be shipped in bags, each bag containing two hundred pounds. Each farmer would then take seventeen bags of dissolved South Carolina rock, one bag of muriate of potash, and two bags of nitrate of soda.

With good management, this material can be purchased and shipped to the central part of Pennsylvania for about $2,600, or at a cost of $26 per ton.

The materials that I have mentioned are, undoubtedly, the cheapest sources of nitrogen, phosphoric acid, and potash in efficient forms that this year's market affords. When these materials are mixed together in the proportions I have indicated, a fertilizer is produced that contains 11 per cent. of available phosphoric acid, 2.5 per cent. of potash, and 1.5 per cent. of nitrogen, and it is, certainly, very rarely the case that a *mixed* fertilizer comes into the market that offers for $26 an equal amount of equally valuable plant-food. Bought in small lots of local dealers or of traveling agents, mixed fertilizers containing no greater quantities of valuable ingredients generally cost about $35 per ton. It may be objected by some that it is a great deal of trouble to mix a fertilizer. By turning out on a clean barn floor, two men, with shovels, will thoroughly mix a large quantity in a half day.

It may be asked, also, whether it would be safe to drill such a fertilizer with the seed. I think so, if no more than two hundred to three hundred pounds are applied per acre. It would be possible, of course, to drill in enough to injure the seed. Some farmers may wish for a kind of fertilizer different from the mixture described above. If so, let such buy less dissolved South Carolina rock, and more muriate of potash, or more nitrate of soda. Each farmer must determine for himself what ingredient, or mixture of ingredients, can most profitably be used on his soil. It is very likely that, where a farmer uses considerable yard manure in connection with the commercial fertilizer, dissolved South Carolina rock alone would be the most profitable fertilizer to use.

It is certain, however, that by purchasing the ingredients and mixing them himself, each farmer can suit his own conditions of soil, etc., better than by buying mixed fertilizers.

I have, repeatedly, urged upon farmers the adoption of the plan here presented, and I know, from actual experience, that it can be put into very successful operation.

There seems to be no necessary reason why these valuable ingredients should cost more in mixed fertilizers than in the standard articles to which I have referred; yet such is the fact, as a study of the prices and materials of the fertilizer market plainly shows. I do not mean by what I have said to imply that manufacturers deliberately make an overcharge for their goods or intend any fraud. I only mean that they have been able, and are still able, to put the mixed fertilizers upon the market at prices that are above those for which it is possible to secure an equal amount of ingredients in an equally valuable form.

There are a great many low-priced fertilizers in the market. This is all

wrong, and is a condition of things for which farmers are in part responsible.

Many manufacturers, in manufacturing fertilizers, use a "filler," *i. e.*, after the pure bone or pure South Carolina rock is dissolved, then sifted coal ashes or some other material is added and is called a "filler." This "filler" is not added in most cases for the purpose of defrauding any one, but in order to cheapen the cost price of the goods so that the selling price may be less.

If a manufacturer dissolves pure bone with oil of vitriol and that adds some muriate of potash and nitrate of soda, he obtains a mixture that costs him considerable, and he must sell at a high price in order to get a profit. He should, for instance, sell such a fertilizer for thirty-five dollars per ton. Instead of doing so, he puts in a "filler" and sells for twenty-five dollars per ton. Why is this done? Because the twenty-five-dollar goods can be sold where the thirty-five-dollar cannot. The former sells more readily because it appears to be cheaper, whereas it is really more costly. Why pay freight on one and one half tons of fertilizer in order to get two hundred and fifty pounds of phosphoric acid when it can be obtained in one ton at the same price per pound, but with less expense for freight and handling? The wise policy to adopt is to be sure that you are buying genuine material, and purchase it in the most concentrated forms that are ordinarily in the market.

I would like to see farmers get in the habit of buying pounds of ingredients rather than tons of fertilizer—to hear them say, "I have bought two thousand pounds of phosphoric acid for my wheat for this year," not "I have bought ten tons of John Smith's fertilizer."

There is a source of plant-food not included under commercial fertilizers which is second in importance to none, viz: Purchased cattle foods. There are many reasons why, in purchasing cattle foods, some regard should be had to their manurial value as well as to their nutritive values. Many farmers regard all statements about the variations in the manurial value of different cattle foods as based upon mere theory. It is true, however, that if nitrogen, phosphoric acid, and potash are of no value in cattle foods, they are of no value in commercial fertilizers, and it is a waste of money for Pennsylvania farmers to purchase seventy thousand tons of the latter each year. But if these ingredients do have value, then of two cattle foods of equal nutritive effect, the one containing the most nitrogen, phosphoric acid, and potash is worth the most. I will not enlarge further upon this subject, for the published reports of this Board contain a review of the principal facts involved.

REPORT OF THE APIARY COMMITTEE.

By M. W. OLIVER, *Chairman.*

In making our second annual report, your committee regret they have not been able to gather official statistics of the numbers engaged in, and capital employed in this industry. The Interior Department of the United States did not, it seems, regard the apiary of sufficient importance as to make provision, when the last census was taken, to collect information to any extent in this industry. To obtain such information as your committee thought desirable to embody in this report, they prepared and sent to a number of prominent apiarists within the State the following list of questions, viz:

1. What is the probable number of colonies of bees kept in the State?
2. What is the average yield of honey per colony, spring count?
3. What is the average price per pound for honey in your locality?
4. What is the quantity of wax produced?
5. What is the average profit per colony, spring count?
6. Are bees destructive to fruit?
7. Are bees of importance in the fertilization of flowers?

To these questions we have received answers, from which we condense, as follows:

1. There are one hundred and twenty thousand colonies.

2. The yield of honey per colony, spring count, may fairly be put at forty pounds. This would give an annual yield of nearly five millions of pounds.

3. The price at which honey has sold has been, for comb, eighteen cents, and for extracted, ten cents.

4. Under the modern method of handling bees and honey, a very little wax is produced, not more than one pound of wax to one hundred pounds of honey. But as there are yet many who cling to the old box-hive, and who drive out and destroy the bees with fire and brimstone, the yield of wax is considerably increased; so that the yield of wax may fairly be put at one pound of wax to seventy-five pounds of honey, or an annual yield of sixty-five thousand pounds.

5. To the bee-keeper of ordinary intelligence, using modern methods of appliances, the profits should not fall below five dollars per colony. To a specialist in charge, the profit seldom falls below ten dollars. The location of the apiary has much to do with the profits therefrom. Near Philadelphia, Pittsburgh, and other cities, the bee-keeper would be able to retail his honey and thus receive a higher price for it than the one who, living so far away, is obliged to sell through a commission house.

6. Are bees destructive to fruit? We answer, in no sense whatever. We hold to the opinion that so long as fruit is in a sound condition, the bees will never harm it; nor have they the power to do so. It is only when fruit is injured by other insects, by over-ripeness, or other causes, that the bees step in to fill their place as nature's scavengers. Many bee-keepers plant grape vines in their apiaries and so trellis them as to give shade to the bees. From these vines as perfect clusters of fruit are plucked as from vines not visited by the bees. Our experience has been that while the rose

bugs have destroyed all the fruit on the vines just outside, that upon the vines inside the apiary has been found unmolested; so that we count them guardians, rather than *destroyers, of fruit.*

7. Are bees of importance in fertilizing flowers? We hold strongly to the affirmative side of this question. We hold, with others, that plants only secrete nectar that they may attract insects. And why, we imagine you are ready to ask, this need of insect visits? It is that they may serve as "marriage priests" in the great work of fertilizing the flowers. It is well known that many plants, such as the willows and chestnuts, are dicœcious. The male element, the pollen, and the female element, the ovules, are on different plants; and so the plants are absolutely dependent upon insects for fertilization. The pollen attracts the insects to the staminate flowers, while the nectar entices them to visit the pistilate bloom. In the case of the strawberry—of which good old Isaac Walton wrote: "Doubtless God might have made a better fruit than the strawberry; but doubtless God never did"—some varieties would remain barren but for these kindly ministrations of bees and other insects. In some plants, we find the stamens and pistiles are on the same flower, but so peculiar are their structural peculiarities that unless insects were wooed by the coveted nectar fertilization would be impossible. Experiments have been made upon red clover, by Professor Beal and other students, in order to learn what assistance bees rendered towards increasing the yield of seed. The plants were covered alike with gauze, that the conditions might be uniform. Bumble-bees were placed under the screens of half of these plants. The bees commenced at once to sip the nectar from the clover blossoms. In the fall the seeds from all these plants were counted. The result was the seeds from the plants visited by the bees was to the unvisited as two hundred and thirty-six is to five. Is not this a solution of the question, Why is the first crop of clover without seed, while the second crop, the bloom of which has been visited freely by bumble-bees—whose long tongues reach down to the nectar at the bottom of the long flower tube—is laden with seed? A knowledge of this fact led to the importation of bumble-bees from England to New Zealand and Australia three years since. The red clover there was found impotent to produce seed. There were no bumble-bees there. The pea-vine and Alsike clover, with less length of tube blossom, are found, in time of bloom, rich pasture-fields for the honey bee; and for their kindly ministrations, from the first bloom a prolific yield of seed is given. It is not with the plants alone mentioned to which the visits of bees prove "angels of mercies." A member of this committee cites a case which came under his observation, where the yield of an orange grove fell off when, upon the death of the owner, the bees were sold off, and when, upon the establishment of a new apiary, the yield was substantially increased. Is there room for others to engage in apiculture? There are in Pennsylvania fourteen million acres of improved lands. This gives a pasturage of nearly one hundred and twenty acres to each colony now kept. Twelve acres of improved land, aided by the flora of the forests, is considered sufficient territory for a hive of bees. We find, therefore, we have abundance of pasturage for ten times the number of bees now kept. The honey harvest may, therefore, be increased tenfold.

We hear of bees from the earliest ages down to the present time. They are spoken of in the Bible many centuries before the Christian era, and in the writings of Virgil and Columella; but they seem to have had no management except that which was dark, mysterious, and uncertain. No good results are reported of them. The correct understanding of their natural history, and the proper application of art and science to their

habits, was left for Huber, Dzierzon, Quinby, and Langstroth. The laws which govern bee instinct were unknown to the ancients. The science and art so applicable and essential in the successful management of them in the present day were unthought of in the past, as they are unthought of now by a great majority of our people. The *light* had not yet come out of them. Sixty years ago the light had not come out of steam and electricity. Now they are the motive power of the world, bearing telegrams to every part thereof. We do not presume to claim for bee-keeping a place among these wonderful agencies, but we do claim for it a place among the industries of our people, capable, by intelligent management, of giving as good results for the outlay as are obtained by any work done upon the farm. It appropriately belongs to farming. Farmers have the soil and the flowers, and, where forage is wanting, they can supply it by sowing and planting. The flowers within your fields and by the wayside contain in their tiny cells a treasure—a delicious sweet secreted day by day—and unless some arrangement be made to gather it in, will be lost upon the air. It is this saving, this gathering in from every available source, that brings thrift and success to the farmer. Shall we let this treasure of the flowers be wasted in our fields or shall we gather it in? is a question worth consideration. In the present state of society, when every one is living up to the full extent of his ability, it is wise to make money from all the honest sources within our reach. If we can, by intelligence in the application of science to the habits of bees, make them a source of wealth to ourselves, we shall add to our happiness and to the wealth of the State.

RESULTS OF A PRELIMINARY EXAMINATION OF SAMPLES OF BUTTER PURCHASED IN VARIOUS PORTIONS OF THE STATE.

By Dr. H. LEFFMANN, *Microscopist and Hygienist of the Board.*

[Abstract of remarks made at the June meeting.]

These topics are brought before the Board at this time as a portion of the report of the Committee on Dairy and Dairy Products as presented this morning by its chairman. As the investigation has merely begun, I cannot give many facts. The discussion this morning has anticipated many of the points that I intended to bring before you this evening, and it, therefore, only remains for me to reiterate the statements briefly.

In the first place, I must assert the opinion that no success can be expected from legislation against substitute butters if based on the claim that these articles are unwholesome. When they were first brought to public notice, medical men and chemists were inclined to look unfavorably on them from a sanitary point of view. The position is now changed. It is now generally understood that the different fats are not essentially different in their digestive qualities. Butter is much like lard and tallow. They are all mixtures of various substances, and butter contains the ingredients of lard and tallow, with the addition of a few per cent. of materials that is peculiar to it, but not sufficiently different from the other ingredients to give to the butter—at least so far as we know—any superior dietetic value, although they give, probably, greater palatability. No facts at present before the scientific world will support the claim that oleomargarine is unwholesome. Dr. Love, whose work in connection with the New York investigation has been referred to, has, in a recent publication, expressed himself as follows:

"We are in the habit of eating all manner of fats in our food, in one form or another, and no one ever thinks of their being more unwholesome than butter. An artificial butter made of clean fat, and in a manner to exclude foreign contamination, has never been shown to be an unwholesome article of food."

Legislation for the protection of the dairy interest must, to obtain the approval and support of chemists, be based on the point of protection against fraud. No one will deny that the buyer has a right to obtain exactly what he asks for, and that, when he is deliberately deceived, a punishment should follow. Oleomargarine, suine, and butterine are not butter and ought not to be sold as such. That they are so sold is merely the expression of the low grade of mercantile honor which has been gradually developed in all branches of trade. Adulteration, substitution, and deception are the rule. What we eat and what we wear, in short, whatever is bought or sold, is now subject to fraudulent modification. It seems to me, nowever, that, for the protection of the community in these respects, the ordinary penal statutes are ample. This point, however, has been developed, much better than I could do it, by the remarks made by Governor Pattison, who showed clearly that, under the criminal code, a penalty could be imposed for obtaining money under false pretenses. Conviction under this indictment would result in fine or imprisonment, and this is all that any special law could give. The proper course to stop the sale of any adulterated article, whether specifically injurious or not, would be for some one to purchase a sample, have it analyzed, and, after obtaining evidence of the fraud, lodge a complaint with the district attorney of the county, who can have a bill prepared and tried. The trial of the case would not only establish the sufficiency or insufficiency of the existing laws, but would also be likely to furnish information as to the legal status of the methods of investigation used.

A satisfactory control of food adulteration involves, primarily, the use of processes of analysis accurate in character, and to devise such processes constitutes a very serious chemical difficulty. We are met, in the first place, by the fact that many articles of food are not constant in composition within natural limits, and it becomes necessary to establish, by frequent examination of authentic samples, the extent of those limits. Secondly, some articles of food are subject to variations of composition or quality on keeping, so that the length of time that intervenes between the preparation of the sample and the analysis of it becomes an element of uncertainty. Thirdly, the large pecuniary interests now involved in some forms of food adulteration induce the employment of experts to devise means to circumvent the tests which are in use, and thus, even now and then, a process which has been satisfactory becomes unreliable. It has been shown, for instance, that any establishment dealing in milk on a large scale could systematically dilute it with water to a certain limit and yet remain secure from prosecution for adulteration. The small dealer, adding water or removing cream at random, generally passes this limit and may be caught, but high-grade milks, the composition of which is previously determined by analysis, may be cautiously reduced without danger. Butter analysis has offered several examples of this kind of scientific "progress." The butter substitutes are generally prepared by a process of melting, while butter proper is always made in the cold. Most fats in passing from the liquid to the solid condition take a crystalline form, and, hence, if a fat shows such an appearance under the microscope, it is proof that it has been melted. As the melting of pure

butter, prior to sale, would be a most unusual operation, the presence of crystals would inferentially indicate a foreign fat. For a while, this microscopic test was available, but the manufacturers of oleomargarine, etc., soon set it aside. By cooling the fat rapidly and with agitation, the crystals may be rendered practically indistinct, and thus the test becomes unavailable. Melting point was, at first, thought to offer a means of detection, but not only is that of genuine butter subject to variation, but, by various mixtures of fats, almost any required melting point can be obtained.

Processes depending on difference of solubility of the fats in various liquids have been devised, but are scarcely as perfect as required for accurate work.

The process which has given good results in my hands is that which depends on the essential difference in composition between butter and other fats. All natural fats are mixtures of two or more simpler fats, most of which are derivations of glycerine, and are hence sometimes called glycerides. Each glyceride yields, by the action of alkali, a soap of glycerine, and from the soap can be obtained, by decomposition, a fat-acid. The fat-acid is different for each different glyceride, but the glycerine yielded is apparently the same. The amount of alkali required to completely saponify the fat is dependent on the fat-acid which the glyceride yields, and upon this fact is based the process of analysis. Butter contains in addition the glycerides of stearic, palmetic, oleic, caprylic, and butyric acids, while tallow and lard contain only the first three. Now the amount of alkali required to turn the first three glycerides into soap is less than that required for the last two, consequently any fat which contains these last two will require more alkali, weight for weight, than one which does not contain them.

From Mr. Eastburn Reeder, chairman of the Committee on Dairy and Dairy Products, I received twenty samples of butter, four of which were obtained for purposes of comparison, and were known to be genuine butters. In the final examination, only one of these, the specimen from Mr. Reeder's own dairy, was examined. The process of analysis was as follows: A weighed quantity of the filtered butter-fat was placed in a glass beaker, and mixed with a quantity of a solution of caustic soda in alcohol, more than sufficient to saponify it. The quantity of butter taken was usually between one and two grammes. After allowing the alkali to act until all the fat was rendered soluble, a few drops of phenolphthalein were added, and standard sulphuric acid run in until the unused alkali was all neutralized. The amount of acid corresponding to a certain measure of the alkali being known, it was easy to calculate the quantity of alkali which had been used up by the butter; in other words, the amount of acid to which the butter was equivalent. The larger this amount the more pure the butter-fat. In working out the process, no reference was made to the list of specimens as furnished by Mr. Reeder; but it would have been possible for me to indicate the bogus articles by the analytical results alone. I added to the list a sample of tallow for purpose of comparison.

Since the investigation was begun, Mr. J. A. Wanklyn has brought before the Society of Public Analysts of England a method of testing butter, depending on the fact that butyric acid and its derivatives give, with alcoholic solution of soda, a distinct pineapple odor, and, therefore, if this odor is not produced with any fat, butter is not present, for butter always contains the glyceride of butyric acid.

In the discussion of Mr. Wanklyn's method before the society, the test was not accepted as entirely satisfactory; but it seems to be an accessory method of some interest, and was tried by me upon the samples I was examining.

The following table gives my results. The column, marked "odor," gives the result according to Wanklyn's test just described.

TITLE BY WHICH SOLD.	Price.	Odor.	Acid equivalent.	Probable character.
1. E. Reeder's,	.35	Marked,	5.5	Genuine.
5. New Hope,	.25	Doubtful,	4.9	Suspicious.
6. York State creamery,	.35	Marked,	5.7	Good.
7. Royal creamery,	.30	Doubtful,	5.1	Suspicious.
8. Roll butter,	.25	Doubtful,	5.0	Suspicious.
9. Best creamery,	.45	Marked,	5.8	Good.
10. Farmer's creamery,	.25	Doubtful,	4.7	Suspicious.
11. Skippack creamery,	.45	Marked,	6.3	Good.
12. Perkiomen creamery,	.40	Marked,	5.6	Good.
13. Creamery,	.40	Marked,	5.9	Good.
14. Suine,	.27	Absent,	4.8	Bogus.
15. Oak Lane creamery,	.30	Weak,	5.1	Suspicious.
16. Roll butter,	.32	Doubtful,	4.8	Bogus.
17. Butterine,	.25	Absent,	4.6	Bogus.
18. Farmer's dairy,	.30	Marked,	6.0	Good.
19. Chester county diary,	.35	Marked,	6.0	Good.
20. Roll butter,	.25	Weak,	5.1	Suspicious.
21. Tallow,		Absent,	4.3	Tallow.

Mr. A. Winter Blyth described before the Society of Public Analysts of England a method for the detection of different fats, based on the figures produced when the melted fats are dropped in water cold enough to instantly chill the drop. Attempts to detect oil adulteration by means of the cohesion figures on water and other liquid were made some years ago. Mr. Blyth's improvement is the extension of this solid fats.

The plan of proceeding is to melt the fat at about the temperature of boiling water, and drop it from a height of four inches on the surface of water or moistened glass. Each fat has a distinctive pattern, which will always be produced if the conditions are maintained. For different fats, special temperatures exist at which the figure is most marked. Thus, for butter, the best temperature is 130° F., the water being 50° F. The pattern on glass may differ somewhat from that on water. The accompanying plate represents some of the important figures as given by Mr. Blyth in the report of his paper. Fig. 1 represents a butter pattern on glass, and Fig. 2 an imperfect one on water. Fig. 4 represents a butterine pattern; careful examination of the film itself shows that it is full of minute crystals. Figs. 4 and 5 are representations of the perfect butter film, which have been transferred directly to the lithographic stone. Fig. 6 shows a figure obtained from a mixture of equal parts of paraffine and stearic acid. The former gives no pattern itself, but greatly modifies the pattern produced by other fats. With fats of high melting point, the water must be somewhat warm, or only shapeless masses will be obtained.

I have not been able to secure results sufficiently constant by this method to employ it in examining butter as found in the market, but I have no doubt that any failure in this respect has been due to defects in manipulation. In my experiments, the figures produced by butter have been too variable, and those produced by other fats—tallow, for example—have sometimes so closely resembled butter that I would have been misled if I had not known the character of the article tested.

CONTAGIOUS PLEURO-PNEUMONIA, (LUNG PLAGUE.)*

By THOMAS D. DUNN, M. D., *of West Chester, Pa.*

September 25, 1883, through the kindness of Secretary Edge, of the Board of Agriculture, and Dr. Bridge, State Veterinary Surgeon, I was invited to be present at the autopsy of some cows suffering from pleuro-pneumonia, belonging to William Thomas, of Chester county. The herd had been in quarantine for several weeks, and their condition being such that recovery was impossible, a number of the animals were killed. They were knocked down by a blow on the forehead, and were bled on the ground. The thorax was then opened and the lungs carefully examined. As both macroscopic and microscopic examinations of the lungs have been repeatedly described, by different observers, in agricultural reports and recent text-books on veterinary medicine, and as it would have no special bearing on the bacterian nature of the disease, a detailed account will be omitted. Suffice it to say, the condition found corresponds to the admirable report of Dr. W. F. Whitney, of Harvard University, (Department of Agriculture, Contagious Diseases of Domesticated Animals, 1880.) Portions of the consolidated lung and blood from the heart were placed in bottles, which had been thoroughly cleansed, and closed with ground-glass stoppers. These were examined by my friend, Dr. George Martin, and myself, and found swarming with germs—*micrococci*.

These little bodies, although seen distinctly by a power of six hundred and seventy diameters, are best studied by a power of one thousand. They are colorless, globular or oval in form, outline regular, and refractive power notable. The Brownian movement is marked. This, however, is a tremulous motion not peculiar to *micrococci*. It is common to inorganic particles, as well as to minute vegetable and animal organisms. They do not seem to move in a manifest manner, independent of the currents of liquid in which they exist. They measure from a third to a half micro-millemeter—that is, from about $\frac{1}{8000}$ to $\frac{1}{6000}$ inch in diameter. They are not dissolved by ether, alkalies, or acids, and take the staining of analine colors slowly. I have prepared them by first treating with a ten per cent. solution of aqua-ammonia, then analine red, and afterwards washing with a weak solution of nitric acid. They multiply in nitrogenous culture fluids, at ordinary temperatures, by millions. They are usually separate, though sometimes in pairs and little cellular colonies, forming distinct zooglæa. From the fact of their being occasionally seen in pairs, it is reasonable to suppose that multiplication is taking place. They resist putrefaction, for the culture tubes started September 26th swarmed with them four months afterwards. When the nitrogenous material is exhausted in the culture

* NOTE.—These experiments in cultivating and propagating the *micrococci*, which are supposed to be the cause of contagious pleuro-pneumonia and the prime means of spreading the disease, were kindly undertaken by Dr. Dunn at the special request of the Department, and the account shows that they have been made with an exactness and care as to particulars which gives them great weight and value. It is to be regretted that no attempts at inoculation, with the results of extended culture, were made, but the experience of European scientists establishes their possibility beyond a doubt.—SECRETARY.

tubes, their growth is stopped, and the *micrococci* remain in a latent state, as it were, until additional food is given, or they are transplanted into fresh fluids. After the tubes stand a few weeks, the membrane, consisting of them, formed on top, sinks to the bottom, and the liquid above clears. That the germs are not dead, but only in a state of repose, is evident from the fact that they rapidly multiply when inoculations are made from them. They grow less rapidly, however, than inoculations from more recent cultures. In the transactions of the Pathological Society of Philadelphia, 1861, I find Dr. J. Woodward, United States Army, presented a pleuro-pneumonia lung of a cow.

His description of the pathological changes gives a fair portrait of the disease. He also mentions certain "spores of fungi" found in both healthy and diseased lung, but he did not describe or classify them, or attempt their cultivation. These "spores of fungi" are probably the *micrococci* under consideration. Aside from this, I have not seen any record of their study. Unfortunately, however, I have not had access to much of the literature of the subject. The following culture experiments were made with the serum virus taken from the diseased lung: The culture fluid consisted of an extract of fresh beef, made by chopping it fine and pouring over hot water. After maceration, the juice was expressed and the extract boiled for several minutes. It was then filtered and again boiled in order to thoroughly destroy all germs. It was then placed in culture tubes, which had been washed in a solution of corrosive sublimate, and afterwards boiled. The tubes were stopped by absorbing cotton, which had been sterilized by washing in a saturated solution of boracic acid and heating. After the culture fluid in the tubes had cooled, a minute quantity of the serum was introduced by a small knife whose blade had been heated in a spirit-lamp. The tubes were then placed where the temperature ranged from ninety to one hundred and twenty degrees Fahrenheit. On examination of these tubes on the 28th, the liquid was found turbid, a thin membrane formed over the surface, and there was a slight deposit. Under the microscope, swarms of *micrococci* were seen. From this cultivation a second was made, and, after standing forty-eight hours, the surface membrane, cloudiness of fluid, and slight deposit appeared, and myriads of *micrococci* were found. From this a third generation was started, in which appeared a few *bacilli*, the first that were discovered. They are very active, colorless bodies, measuring from three to five micro-millimeters in their long diameter and from one third to one half in their short. Their movements, at times, are very rapid, again they are in a state of repose. Sometimes, one will remain a long time motionless, then suddenly dart across the field of the microscope, setting many of its fellows in motion, who seem to catch the spirit of the active *bacillus*. At one time, they advance with the rapidity of an arrow, then retreat or describe circular lines. It was noticed, in those cultivations in which the *bacilli* were found, the surface membrane was thicker and more tenacious. In cultivations conducted at lower temperatures, the development of *micrococci* was not so rapid. Fearing that some atmospheric germs might have been introduced with the culture, other cultivations were begun from the second generation in which no *bacilli* were found. The culture fluid was repeatedly boiled at intervals to kill germs that might develop from spores not destroyed by boiling, and as a further test, non-inoculated tubes of culture fluid were placed by their side. In forty-eight hours, the former were swarming with both *bacilli* and *micrococci*, while the non-inoculated ones remained clear. These, subsequently, developed germs after inoculation. A second series of experiment was commenced with fresh virus obtained October 4th. The first and second cultures were pure, but in the

third, *bacilli* appeared, and in the fourth they had greatly increased. It is difficult to explain the relation these forms bear to each other, as to whether the *bacilli* are organisms developed from the *micrococci*—the latter being in a sporal stage of their growth—our investigations will not justify a positive answer. In a series of observations, pure cultures were secured to the seventh generation. I think the success in this was due to the rapid cultures, as I have been unable since, with great care in the sterilization and inoculation, to procure pure cultures farther than the fourth generation. In that series, a culture was made every twenty-four hours, in the others, every third or fourth day.

Koch has determined that the *bacilli* of anthrax develop veritable spores, and they in turn develop *bacilli*. Several other observers hold this view, and, according to the investigations of Koch, Cohn, and Pasteur upon the development of *bacteria*, it is probable that the spores of *bacilli* and other *bacteria* are identical with *micrococci* in form, aspect, and behavior toward chemicals. In those diseases in which certain *bacilli* and *micrococci* are found to be the virus, it is impossible to distinguish them from harmless ones by their microscopical appearance; that is a specific disease germ which can only be determined by its effects on living organisms. Koch's *bacilli* of consumption are identical, microscopically, with the *bacilli* of *septicaemia*. The same may be said of the bacteria found in septic matter, which, when inoculated, proves perfectly harmless to animal life.

The *micrococcus* of pleuro-pneumonia, so far as present observations go, is identical with that of diphtheria, chicken cholera, and the recently discovered *micrococcus* of scarlet fever. It is further found that the germ of virulent matter rendered harmless by attenuation does not differ microscopically from the unattenuated which, destroys life.

In the June and July numbers (1882) of *Flemming's Veterinary Journal*, there is an important paper by R. Rutherford, M. R. C. V. S., on inoculation as a preventive of pleuro-pneumonia. His results were very satisfactory.

Inoculation has been quite extensively practiced in England and on the Continent, and, in every instance, it has checked the spread of the diseaes. There is no evidence that animals while suffering from the effects of inoculation communicate the disease. I have made no inoculations on animals with the *micrococcus* of pleuro-pneumonia. However, several experiments have been made in view of destroying the germ, the results of which I will briefly state. A tube containing cultivated *micrococci* was boiled, and from it a second was inoculated. In thirty-six hours, the tube contained many *micrococci*, showing that the germ is not destroyed by a temperature of two hundred and twelve degrees. A culture fluid, to which had been added ten per cent. of alcohol, was then inoculated. No *micrococci* had developed in one week afterward. One and one half per cent. of benzoic acid, with borax to dissolve, was then added to a culture fluid; neither *micrococci* nor *bacilli* had appeared six weeks afterwards. Another culture was started, to which was added corrosive sublimate in the proportion of one half grain to the ounce. In three weeks, there were no traces of germ, life. To test the influence of cold on these organisms, a tube containing cultivated germs was frozen, and from this sterilized liquids were inoculated. In forty-eight hours, they contained myriads of *micrococci* and a few *bacilli*. A portion of diseased lung was frozen, and inoculations from this grew in about the same time. It was afterwards found that the cotton which had been sterilized by heat and boracic acid had been inadvertently exposed to old cultivations and decomposing organic substances, and it is possible that *bacteria* were introduced by it. Within the past few days, I have repeated

these experiments, and find that while inoculations from non-frozen virus develop *micrococci* in a few hours, it requires several days for sowings from frozen specimens to grow in the same culture fluid and under the same conditions of temperature. Whether they were not exposed to the cold long enough to destroy them, or the influence of cold is only sufficient to render them inactive, future investigations will be required to determine. It is my impression that cold will check the spread of the contagion, but not destroy it altogether, and that when the disease once attacks an animal, cold will have no influence upon it, though it may prevent the spread of the infection to others in the same herd.

The power of medicinal agents to control the disease is generally supposed to be very weak. It would seem that corrosive sublimate, alcohol, and benzoic acid arrest the growth of these germs, but whether doses sufficient to destroy them can be administered without endangering life, our veterinary surgeons must determine.

The best known treatment for diphtheria is alcohol and corrosive sublimate. Dr. Keating, of Philadelphia, in a malignant form of measles which proved so destructive to the children of Blockley alms-house two years ago, found the blood of the victims filled with *micrococci*. He records more cases of recovery under the free use of alcohol than under any other treatment. From these facts, the use of these agents should be given a fair trial. I think, however, the most fruitful and practical field for investigation will be found in obtaining an attenuated virus, which, by the inoculation of stock, will produce a mild form that will prove a protection from the disease.

It is a peculiar fact, pointed out by Pasteur in his studies of the *bacilli* of anthrax and chicken cholera, that virus weakens by cultivation, and that the degree depends more upon the length of intervals between cultures than upon their numbers. He commenced a series of experiments, starting several culture tubes, and at the end of each month inoculated animals from one. He found the older the virus the less virulent was the disease, and that an attenuation could be obtained that would produce a modified form of the malady, not dangerous, which was a protection against exposure, as well as against inoculation of the strongest virus. Acting on this principle, inoculation was begun on stock in France, and the successful results need no comments. Pasteur says, in regard to the attenuation of the virus of chicken cholera: "With intervals between the sowings, it is found, on repeating the cultivations—that is to say, with a mortality of ten fowls from ten inoculations—there occur descending mortalities of nine, eight, seven, six, five, four, three, two, and one out of ten. Sometimes there is no mortality whatever; that is, the disease is manifested with all the subjects inoculated and all recover. In other words, by a simple change of the mode of cultivating the parasite, by the single fact of increasing the periods between the sowings, we have a method of obtaining progressively decreasing virulence, and, finally, a true vaccinal virus which does not kill produces a benignant disease, and preserves from the fatal malady." This celebrated scientist claims that the attenuation of this microbion is due to the exposure to oxygen. It is impossible in the limits of this paper to go into details of all experiments by which he arrived at this conclusion.

The former theory that cultivations alone are sufficient to attenuate virus is not wholly true, and whatever attenuation has been attained by cultivations is due more to the exposure to oxygen than to the number of cultures. In both fowl cholera and charbon, when rabbits were inoculated by virus that had been cultivated every twelve hours, he found in all the

cultivations the same virulence; that is, "if we take a rabbit as a criterion of virulence, these animals die just as readily and promptly from the last cultivation as from the first." The contagion of contagious diseases in passing from one individual to another becomes attenuated, and the disease, of course, less virulent.*

This is borne out by the fact that during the first outbreak of a highly contagious disease, as Asiatic cholera, yellow fever, or small-pox, the mortality is greatest. In these fatal diseases, of those attacked first, often seventy-five per cent. die, while, as the epidemic progresses, the rate gradually diminishes, until all attacked recover. This seems a reasonable explanation, and it is probable that the reason for a subsidence of the disease lies in the attenuation of the contagion until it becomes innocuous. Again, this attenuated virus, which may have been lurking in the soil, clothing, or elsewhere for years, is brought, under favorable conditions of temperature, moisture, and nitrogenous substances for its cultivation, and there is a rapid increase of virulence. An isolated case generally marks the beginning of an epidemic, and the epidemic seldom appears simultaneously in places remote from each other.

The prevention and management of pleuro-pneumonia requires careful consideration. Recently, our veterinarians have strongly urged, as the only means of exterminating the disease, the necessity of killing all animals affected, and putting the herd into close quarantine This is all very well; at the same time, they slaughter the animals, bleed them on the ground, and bury the carcas under one or two feet of earth. The surface is drained into brooks which often water many herds in their course. From some of the experiments herein recorded, it is seen the germs are not easily destroyed by boiling or freezing. Theoretically, it is true that if the virus is not taken for some time it may become somewhat weakened by exposure to oxygen, but oxygen is almost entirely cut off from the buried carcasses. Pasteur has demonstrated that spores may be carried to the surface by earth-worms, even when the infective material is buried at a considerable depth, and that these spores may produce anthrax in animals pasturing on such grounds. In an outbreak of anthrax near Nancy, the water which moistened the pasture was suspected as the source of contagion. It was found to contain *bacilli* similar to those in the blood of the diseased animals, and when inoculated, hypodermically, on a guinea-pig, caused death of charbon in two days. Hence, for the complete eradication of the disease, cremation of the slaughtered animals is imperative.

For disinfecting purposes, those agents which have been found most powerful in destroying germ, life require thorough investigation. The power of medical agents in controlling the disease is, unfortunately, very feeble. It is doubtful whether those agents (corrosive sublimate, alcohol, and benzoic acid) which have been found to arrest the growth of these germs can be given in quantities sufficient to destroy them without injury to the animal. They should, however, be given a fair trial.

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* Our experience with ninety-eight herds proves conclusively that the virulence of the disease diminished with the generation or propagation from the originally infected herd; that is, a herd infected by the original one always exhibits the disease in a lighter form than in the herd from which the infection came, and as the disease progresses, from herd to herd, it becomes lighter in form, and causes less mortality. As an exhibition of the weakening of the virus in its passage from animal to animal, we can have no better illustration than that found in the so-called Texan fever; the southern animal will infect every Northern animal with which it comes in contact with; but the infected Northern animal has no power to infect another, one transmission of the virus from the Southern animal seems to so weaken it as to destroy its power of transmission. SECRETARY.

The virus of pleuro-pneumonia should be investigated in view of obtaining an attenuation for purposes of vaccination.

All modern methods of scientific inquiry should be resorted to in order to determine rational preventive and curative measures to check the spread of this destructive disease, for, should it break out in the large herds of the South and West, the damage to the health and financial interest of our people cannot be estimated.

QUESTIONS THAT ARE ASKED ABOUT FERTILIZERS.

By Professor W. H. JORDAN, *Chemist of the Board.*

A discussion of questions pertaining to fertilizers is of general interest to farmers. They are questions that have been treated at length, and are those about which I have had occasion to say a great deal in one way or another within the past few months. I have not come at this time to present a formal paper on the general subject, but to make such remarks as I shall be able, that will possibly draw forth questions, and a general discussion of some of the points involved, on the part of farmers and others present here. I say that the questions pertaining to fertilizers are important, and are involved in the interests of farmers, and of society, as a whole. They are questions that have some relation to the general financial and business conditions of the country. Of that I have nothing to say, but my purpose is to speak for a few minutes upon the questions that farmers are apt to discuss concerning commercial fertilizers. All questions cannot be answered. Farmers can ask questions that no man can answer. We have been talking about the experiments with fertilizers, and the right course to pursue, until he that wants knowledge from the scientist is led to expect too much. We cannot answer everything completely. We have a great deal to learn, and, at the same time, we cannot learn too much.

There is one fertilizer that has been used for years, and that is barn-yard manure. There is not a farmer in this State but has a great deal of faith in the effect of this sort of manure on his soil. It has been only since about 1840 that we have had these "new fangled manures," and farmers have been slow in learning about them. When commercial fertilizers first came about, farmers considered them a sort of medicine with which they were to doctor the soil. But we have learned a great many facts, and to-day the knowledge of commercial fertilizers is on a good basis. One of the first points to consider, as a basis for discussion, is "How do commercial fertilizers compare with barn-yard manure?" "In what do they differ?" A pile of yard manure, in an unfermented condition, as it is made in Pennsylvania, with a great deal of straw in it, and weighing three thousand five hundred pounds, contains two thousand seven hundred and twelve pounds of water, which is not of great fertilizing value. The analyses that have been made of the various kinds of yard manure show the amount of water contained to be from sixty to seventy-five per cent., and so ordinary barn-yard manure is about three fourths water. So much, then, of the thirty-five hundred pounds

is accounted for. Seven hundred and ten pounds of the rest of it would be organic matter, or material that you can burn. The remainder consists of about seventy-eight pounds of material that you could not burn away, or mineral matter, which corresponds very closely in composition with the mineral matter that is in ordinary commercial fertilizers.

One hundred pounds of a commercial fertilizer, consisting of a mixture of sixty pounds of dissolved bone-black, twenty pounds of sulphate of ammonia, and twenty pounds of muriate of potash, would contain about the same amount of mineral matter as the quantity of yard manure mentioned, and this mineral matter would contain almost the same ingredients, though in somewhat different proportions.

A commercial fertilizer, compounded as I have indicated, would contain nitrogen, and the ash or mineral matter of yard manure is destitute of this ingredient. The nitrogen of farm manures is contained in the organic portion, or that which can be burned away; so that if we put the nitrogen of the seven hundred and ten pounds of organic matter contained in the thirty-five hundred pounds of yard manure, with the seventy-eight pounds of mineral substances, we should have a fertilizer very similar to the hundred pounds of commercial fertilizer of the kind indicated.

It is often said that yard manure is a complete fertilizer, which is one of the arguments put forth in favor of its use as against commercial fertilizers; but many commercial fertilizers are just as complete plant-food as is barn-yard manure. I am not making an argument against barn-yard manure, but state the facts as they are.

In comparing the valuable ingredients of the thirty-five hundred pounds of yard manure with a quantity of commercial fertilizer that would contain about the same amount of mineral matter, (the hundred-pound mixture sunggested,) I find that the yard manure would contain more nitrogen, more potash and magnesia, but less lime, and very much less phosphoric acid and sulphuric acid. The nitrogen of the particular commercial fertilizer used for comparison here is in the form of a mineral salt, while in the yard manure it is in the organic form. The phosphoric acid is mostly soluble in the commercial fertilizer, while in the yard manure it is not. Both fertilizers, however, are complete fertilizers. The great difference between yard manure and the complete fertilizer is that the former contains a great deal of organic matter—that is, material that can be burned—and the latter does not, and the question is often asked: "Is not that organic matter a very essential thing on our land?" "Is it not essential that we should apply a great deal of organic matter?"

This organic matter has certainly a very important influence on the soil. It has a tendency to make heavy soils light, and to make dry soils retentive of moisture, and to make the soil warm, because of the change of color. That organic matter is a very essential constituent of soils is not to be doubted. Bnt here comes in a point, about which I was speaking on the cars this morning, coming to the meeting: "Do we not, by our ordinary methods of farming—taking the ordinary rotation of crops, including wheat, corn, oats, and grass—do we not, in turning into the soil the roots and stubble of these crops, and allowing them to decay, furnish our fields with all the organic matter they really need?" The final decay of the roots of the wheat, the corn, the oats, and the grass, in this rotation, is very advantageous. Estimates have been made of the weight of the roots of clover, and other crops, in an acre of land—the weight of the roots and stubble that are turned under. In various experiments that have been made by digging around and separating the roots, it has been found that the roots and stubble varied in weight from fifteen hundred to six thousand

pounds per acre. That all decays in the soil and furnishes a great deal of organic matter. There is a large amount of material turned under which may amount to several tons per acre, and it is possible that we can get along without the organic matter of the yard manure, and supply the plant-food in another form. If the material of commercial fertilizers is just as much plant-food as that contained in barn-yard manure, then the question comes: "Can we farm continuously by the use of commercial fertilizer and not use yard manure?" We shall have to get our answer from experience, if we get it anywhere. I can point to one instance of the continuous use of commercial fertilizers for a long series of years. I was talking this morning about the experiment station of Lawes & Gilbert. They began with experiments on commercial fertilizers a number of years ago, and, lately, have been getting out a very valuable summary. The yield of the land when they took it was about the same throughout. They put at the rate of forty thousand pounds of manure per acre upon some plots of ground, and upon others they used commercial fertilizers. The yield on those plots where they grew crops from commercial fertilizers has been as large, or a little larger, than where they used yard manure. This is an important fact with reference to some experiments that have been carried on over thirty years.

I have had occasion to notice, within a short time, the effect of some commercial fertilizer that have been used for a few years at the college. We have a series of plots on which we carry on a rotation of crops, manuring some with yard manure, and others with commercial fertilizers. They are side by side. We have generally got as good crops, and a little better, from the commercial fertilizers as we have from the barn-yard manure.

I cannot point to many examples that have continued so long as to furnish a guide to farmers; but this question, it seems to me, is one of great importance to the agriculturist. That farmers can use commercial fertilizers alone provided they frequently turn under a heavy clover sod seems very probable. I know if a field is planted every year in potatoes, instead of retaining the proper material the land would get sticky and runny. It needs organic matter to improve its condition. In the case of the market-gardener, when very little organic material is plowed under, stable manure is a necessity. The conditions are different with the general farmer.

Mr. JEFFRIS, of Chester. On this supposition regarding yard manure, I would like to ask this question: If that yard manure is composed of the refuse taken from the stall. and exposed instead of being covered, the animals having been fed on straw or hay, would it be materially different from that where the animals were fed on grain, and passed in that style through those animals, and turned into manure? Would not those fertilizers made in the dry and those kept entirely in the dry be quite different in the chemical result?

Prof. JORDAN. The gentleman's question involves several points. Manure that receives no rain, that just receives the water that is taken from the drink of the animals, or urine, contains about seventy-five per cent. of water. You suggest a difference in the manure on account of the food that the animals eat. Manure from animals fed on hay and oil cake is much more valuable than from straw-fed animals—receiving no grain. I was just referring to ordinary yard manure.

Mr. JEFFRIS. One would be a complete manure of the very best elements taken from the soil, as I understand.

Prof. JORDAN. They would both be complete as to the kinds of ingredients, only one would contain more of certain things than the other.

Mr. JEFFRIS. You have all the constituents to make your complete fertilizer; but you do not take them to make life from the plant.

Mr. JORDAN. To continue, I want to touch next upon another point that is involved in this discussion. It seems to me that it makes a great difference what sort of fertilizer we mean when we talk of commercial manures.

Fertilizers can be divided into two general classes—those that are complete, or that contain all the needed ingredients of plant growth, and those that are incomplete, or that lack some of the important and essential constituents of plant-food. Yard manure, and a commercial fertilizer similar to the mixture that has already been mentioned, are examples of complete fertilizers, while plain dissolved South Carolina rock is a good example of an incomplete or partial fertilizer. The latter contains an insignificant amount of potash and no nitrogen. It is a partial fertilizer in the sense of being unable to supply these ingredients.

Yard manure is the result of decomposition of plants, and therefore contains all the ingredients from which the plants grow. One kind of stable manure may contain more of certain material than another kind, but both contain the same ingredients. South Carolina rock does not contain all the elements from which the plant grows, and, as a result, but partially serves the needs of plants. What is the result if I apply barn-yard manure? The result is, I keep the soil well balanced. What is the result if I use a partial fertilizer? I may use South Carolina rock, which contains phosphoric acid as the principal ingredient, and that a valuable one. The soil I am cultivating may not need anything more to supply its deficiencies. But the plants are taking from the soil all the ingredients that are needed for their growth, and if South Carolina rock constitutes the only manure, the soil must constantly be growing poorer in, or less able to supply, certain ingredients, whose loss is not made good by the manure. Thus, if we use continuously a partial fertilizer, the results may be very different than where a complete fertilizer is used. So we may need to resort to complete fertilizers in the end. Our friends may look at the financial side of the question and say, "We cannot afford to buy that which the soil does not need, simply because it may be needed some day in the future. We will furnish what the soil does need, and wait until it needs the other." I simply place before you what may be the result of partial fertilizing. I have not the slightest doubt that the ultimate effect will be quite different from the use of dissolved bone-black, or dissolved South Carolina rock, which is a partial fertilizer, not containing potash or nitrogen, and the use of a mixture of dissolved bone-black, an ammonia salt, and a salt of potash, because one furnishes only some, and the other all, the kinds of material needed in plant-food. I am quite willing to believe that dissolved bone-black may often be more profitable for a time than the use of the mixture, because the cost of the latter is much greater, and in some cases without a proportionate increase of crop.

Another point is worthy of attention, and that is the question of commercial fertilizers being stimulants. We say a substance is a stimulant when it causes increased use of material in the soil without making good the loss thus occasioned. While in this sense commercial fertilizers may have something of the effect of a stimulant, there is a sense in which they are just as true plant-food as yard manure, and the nutrition of plants is their principal office. Some ingredients have something of the effect of lime. Lime is a stimulant in the sense I have just indicated, and certain ingredients have a tendency to increase the use of certain soil material just as lime does. That is not, however, the principal use of commercial fertilizers.

Mr. STEBBINS, of Chester. The gentleman has ruled that you can overdo the matter by putting commercial fertilizers on the land. Can we not overdo the matter by putting on too much barn-yard manure? Why is it that we put on any quantity of barn-yard manure, and it does not injure the ground, or prevent the growth of the crops; but in putting on commercial fertilizers you may destroy the utility of the soil? How is that?

Prof. JORDAN. The gentleman is mistaken in saying that I stated we can put too much commercial fertilizer on the soil. Such a thing would be possible, of course. I am not aware that it is ever done. I have seen a thousand pounds per acre of the best fertilizer put upon land without bad effect. I do not understand how it is possible, by the proper use of commercial fertilizers, to injure the soil. I know of certain instances where farmers think they have injured their soil, but that was on the coast of Maine, where they have applied great quantities of the refuse from manufacturing fish oil, which furnished nitrogenous material to a very great extent, and very little of anything else. This fertilizer was only a partial fertilizer, and caused the soil to become drained of the available mineral plant-food. But if the soil is properly treated, there is no danger of a farmer injuring his land, provided that his general system of farming is good.

THE BEST HORSES FOR FARM AND ROAD USE.

By I. GARRETSON, *Member from Adams.*

[Read at the Annual Meeting.]

Every country of the earth has a breed or breeds of horses, each with its peculiar characteristics, and the horses of Asia, Africa, Europe, and America, have their points of difference as strongly marked as do the human inhabitants of the four grand divisions of the globe.

Besides the peculiarities resulting from local influences of climate, the horse has others which are due to the treatment and training received at the hands of his master, since from a long course of artificial breeding and feeding has become a purely artificial animal, except among barbarians or savage tribes. Among savages, his hard environment has made him degenerate, has, in fact, reduced him to a condition inferior to that of the horse found running wild, where they have increased and multiplied on pasturable lands after having escaped from domestication. The farm and road horse is the most important member of the equine family, because that he is used by the largest number of people, and is employed in the production of that which sustains life in man.

The farm and road horses cannot lay claim to the dignity of distinct breeds, as they are composed of mixed blood, and are dependent for whatever valuable qualities they may possess upon the intelligence of the people by whom they are bred. The majority of farm and road horses are inferior to the more respectable of the fixed breeds, though of late years they have steadily increased in valuable qualities through the introduction of superior blood; and, in many districts they are, as they should be, bred with reference to their sale for particular uses, after they have partially paid for their

care by their labor on the farm. The farm and road horse should essentially be horses of all work, of good style and action. and about fourteen to sixteen hundred pounds weight. Such horses will be able to do anything that may be necessary to be done about the farm on the road or plowing, reaping, hauling, or drawing the family carriage to meeting.

The people throughout the whole country begin to turn their attention toward the production of large horses from both necessity and profit.

They no longer find sale for the kind of horses they bred a few years ago, while there is an active demand for large, compactly-formed horses at splendid prices. Every man knows this to be a fact, but I doubt whether many have taken the trouble to inquire into the cause. The fact that large horses are readily sold at highly remunerative prices, seems to be sufficient to warrant men in breeding to first-class stallions; yet a man who intends to invest very much money in the business should look for some more substantial reason than the mere fact of a good present demand. If small horses are low, and large horses are high, there is some good reason.

Whatever the causes are that have contributed to produce this effect, we ought to know in order to intelligently direct our future course of breeding. On investigation, we find this condition of the horse market is not confined to the United States alone, for go to what country we will—England, Ireland, Scotland, France, Belgium, or Germany—we find that draft-horses, during the last twenty-five years, have doubled and trebled in value. Many of us, within that time, will remember that a good heavy work-horse would only command from $125 to $150, and now $300 to $400 is looked upon as only a fair price for a good, serviceable, large horse, and often $500 is realized.

This advance in price is not because they are breeding less of the large kind. Quite the contrary; for, under the stimulus of constantly increasing prices, their production has been largely increased, and many of the most practical men of the time have become interested in the improvement and breeding of them.

Yet, notwithstanding their rapidly increasing numbers, the prices continue to advance, plainly showing that the supply is not adequate to the demand, and that there are needed and being used a larger number of draught horses than ever before.

Why is this? A few words will tell.

From the commencement of the application of steam as a motive power, a new commercial era began which has changed all things. Railroads have superseded the stage-coach, and gradually thrown out of employ a vast number of small horses. The enlarged facilities for rapid, safe, and cheap transportation has swelled commerce to an extent never dreamed of under the old order of things, and opening a hundred new channels for the use of his heavy, muscular, and active horse. In the great cities, railroad centers, factories, foundries, mills, machine-shops, quarries, and in the lumber woods, thousands more are now annually purchased than were needed years ago. The American farmers are also beginning to find deep tillage and a more systematic and economical method of cultivation necessary, in which a large class of horses are indispensable. Thus, on every hand, we see the plan of usefulness of the large, strong work horse extending, while that of the small family is yearly becoming narrower.

"I value a horse, of whatever weight he may be, whether one thousand pounds or twice that, for what there may be in him."

The best breeds for farm and road work, as my experience has been, are, Percheron, Norman, and Clydesdale, The Conestoga horse holds a prominent place in the history of horses, one of the very best of American

horses for draft, for all work in fact, on the road or on the farm, but he has become extinct as a breed.

The Percheron-Norman is described as follows: "Nostrils large and well dilated; eye good size, mild and expressive; forehead broad and full, ear short and fine. Neck rather short, but nicely filled out. Withers usually high. Shoulders long and nicely sloped. Breast broad and deep, body well rounded. Croup horizontal, broad and flat on the best varieties. Tail attached high. Joints short and firm. Feet always good. Skin very thin, and hair of the finest quality. Mane abundant and unusually fine and silky."

To remarkable strength, to vigor which does not degenerate, to a conformation that does not exclude elegance, it joins docility, mildness, patience, honesty, great kindness, excellent health, and hardy and elastic temperament. Their general color is gray, running from iron-gray to the handsomest dapple-gray.

"*Points of the Clydesdale.*—The jaw is broad and strong, and the muzzle, though neither well developed nor fine, is provided with large nostrils, capable of being widely dilated. The eye, though mild, shows courage and vigor. The forehead is broad between the eyes and capacious. The ears are rather long, and, by their intelligent motion, indicate activity. The head is well set on the neck, and the neck, as it swells to the shoulders, is massive, with great development of muscle on the top. The shoulder is tolerably oblique, fully so for a draught horse. The breast is full, broad, and strong. The leg is long from the arm to the knee, and short from the knee to the fetlock. The forearm is amply provided with muscle. The knees are large and bony, and, from the knee to the fetlock, and from the hock down, the limb is covered with long hair; at the fetlock, the hair becomes thick and shaggy.

"The back and body of the Clydesdale can hardly be called symmetrical; yet the barrel is round, with the ribs extending well back toward the hip. The quarters are broad and low, with muscular thighs and large, clean, broad, well-developed hocks. The lower limbs are flat, as they will be in any horse well developed in muscle and tendons. The hoofs large, tough, wide, are joined to oblique pastern. The characteristic color of the Clydesdale is brown with white marks. The height is about sixteen and a half hands; and both in walking and trotting there is a majesty about their movements showing the power that nerves their action."

WHAT ADVANTAGES DOES AGRICULTURE OFFER A YOUNG MAN ABOUT TO CHOOSE AN OCCUPATION?

By GABRIEL HIESTER, *Member from Dauphin.*

One of the most important steps that a young man has to take is the choice of a profession. On this choice, in a great measure, depend his future success and happiness.

Nature has wisely endowed men with different tastes, different capabilities, different impulses, widely different capacity for business and enjoyment, and has furnished widely different occupations, so that every one may have work and pleasure suited to his peculiar tastes and capabilities.

In the choice of a profession, a young man is generally influenced by his tastes. His tastes are, to a certain extent, acquired by association. He naturally thinks first about that business or profession which he has seen carried on during his boyhood. If his father is prosperous, his thoughts naturally turn to his occupation as the one best suited to him. If his father has a hard struggle for a livelihood, he just as naturally determines to seek his fortune in another direction. Every one would like to look forward to a middle age of ease and comfort, and just here how many make the great mistake of their lives, under the impression that the surest way to secure this is to amass a large fortune.

Our daily papers abound in instances of men who have, after a season of apparent prosperity, during which they enjoyed the confidence and respect of their fellows, become reckless in their mad desire for wealth, forgotten the duty they owed to themselves and their fellows, proved false to their trust, have been discovered, and, broken in fortune, they spend their remaining days disgraced, dishonored, and shunned by their fellows, if they are so fortunate as to keep out of a felon's cell.

It is true that money honestly earned and judiciously expended brings with it comfort and enjoyment, while without it life is, at best, one of hardship and privation. But to properly appreciate and enjoy the possession of anything, we must at times feel the want of it.

If we look carefully into the lives of men in all classes, we will find that those who enjoy life most, who give most enjoyment to others, who do the most good in proportion to their means, who leave behind them the cleanest record and are most regretted when they die, are the well-to-do and moderately wealthy farmers, mechanics, merchants, and professional men, while those who have been most successful in accumulating money, whose names and business transactions are lauded in our daily papers, who are honored as our money kings, and who are too often held up by parents as an example for their sons, are, as a rule, the most unhappy and discontented of men. Their lives are the most barren of everything that pertains to true happiness and true comfort. Looking at the question from this standpoint, let us see what inducements agriculture has to offer any one about to choose a profession.

If a farmer manages properly, he will have a peaceful, quiet occupation, free from heavy risks and great excitement; and while he has his busy seasons, during which, for days at a time, he is obliged to work early and late, and make use of every available moment of time, he has, in the course of the year, as many leisure hours and days as a man in any other business; and when these leisure hours come he, always has the means right at hand for enjoying himself, and giving innocent enjoyment to his family and friends. When his day's work is done, he can go to bed and sleep soundly till morning when he awakes refreshed and invigorated, feeling indeed like a new man. He can always have plenty of pure, cold water to drink. When he is at his work or in his home, by night and by day, he can breathe pure air, untainted by coal-gas, sewer-gas, or the effluvia from the wharves or the fish-market; can see his children grow up rugged as pine-knots under the genial influence of pure country air and good, wholesome food. He will have one of God's greatest blessings, a good appetite, and his table can always be supplied with an abundance of just the right kind of food, home-grown and fresh, such as sweet butter, rich cream and milk, fat, juicy poultry, fresh eggs, fresh vegetables taken right from the garden the same day they are eaten; luscious fruit from the day the first strawberry makes its appearance in early summer till the last pippin and russet apple disappears late in the spring, while his larder can always be stored with the

finest canned and dried fruit, preserves, and jellies, free from glucose or any other adulteration. These are luxuries which are always expensive and generally unattainable at any price in the large cities.

He can have a good horse and a comfortable carriage at his disposal when he has occasion to drive out either for business or pleasure. He has the satisfaction of seeing that whenever he makes a well-directed effort in any direction, nature comes bountfully to his aid and carries on the good work even while he sleeps, and while his bank account may not compare with that of some professional men and merchants, he can always keep the balance on the right side, and see his farm increasing in value, his home becoming more beautiful, and all his surroundings improving with each successive year, and when a money panic sweeps over the country, causing the supposed fortunes of thousands of business men to melt suddenly away, he stands secure, because he has only to depend upon a bounteous nature for support, whose gifts are not dependent upon the rise and fall of any market, and who never puts more water in her stocks than she is able to carry.

"But," some may say, "if this be so, why do we see so many farmers of middle age, broken in health and spirits, with hardly money enough to buy a wheel-barrow, much less a family carriage, who live the year round on salt meat and potatoes, work hard from daylight till dark every day in the year, and yet are always behindhand in their work and their payments?" I answer, these are men out of place; as a rule, they have no advantages of education; as boys they were taught that the chief end of man was to work, that time spent on book-learning or devoted to recreation was so much time wasted; they grew up laborers, with no idea above the actual labor of their hands, and no knowledge of business or business methods, and now they must be satisfied with laborer's wages and laborer's fare.

They have not the capacity to manage for themselves, and would be a great deal more comfortable if they would work for some one else. What I have said does not apply to this class, but is intended for men of intelligence and energy, who have the capacity to rise in other walks of life, who would not be content to remain at the bottom of any profession. To these, I say, agriculture holds out the inducements above enumerated.

To this, as in other occupations, overcrowded as they all are, there is plenty of room at the top, and for those who, by careful, determined effort, will reach the top, there awaits the sure reward of comfort, honor, and a middle life and old age of comparative ease, lived amid the most pleasant surroundings.

It is true that many farmers fail even after a few years of success, but in every instance the cause can be traced directly to outside influences. Either he has been induced by friends to run for a political office, or he has gambled in stocks, or has indorsed for a dear friend who was as sound as the State itself and only wanted his name for form's sake, or has invested all his surplus capital in a manufacturing concern, or engaged in some other enterprise of which he was entirely ignorant, and to this he can trace his failure. I cannot recall a single farmer of my acquaintance who stuck closely to his business, and devoted all his energies to that one thing, who has not bettered his condition with each successive year. And if farmers or others will engage in enterprises, the management of which they do not understand, they must abide by the consequences, which in nine cases out of ten are disastrous.

In order to secure the greatest profit from our farms, we must become specialists; the time has gone by when farms can be managed in the good old-fashioned easy way; the country is becoming too much crowded for

that, and competition too brisk. No one man can hope to excel in all the various departments of agriculture, but each one must adopt one particular product, for which his farm, by reason of its location, as regards the different markets, and the quality of its soil is especially adapted, and throw all his energy and all his mind into that one channel, so that the product of whatever kind shall have an individuality about it that may be recognized at once.

Thus, if he select fruit, he should go further than that, and whilst he may furnish a general assortment of fruit throughout the season, he should make a specialty of one particular variety, and, by constant care and close study, not rest satisfied until he grows that one crop in greater perfection and abundance than any one else in the market, and by the excellence of the article, and the care with which it is put up, and the uniform good condition in which it reaches market, create a demand for that particular brand which will insure its sale at good prices, even though the market be overstocked with inferior goods.

The same with milk or butter, if either of them should be selected. Let others dilute and adulterate as they will, the man who, by careful selection of his cattle, judicious feeding, absolute cleanliness about his stables and milk-room, accurate and intelligent handling of the milk and butter in all its forms, will always furnish a strictly pure and uniform article, will not only always find ready sale for his produce at fair prices, but his brand upon an article will carry with it a guarantee as to purity and quality that at once satisfies the buyer without further test.

If he choose stock, he should not only try to raise good stock, but should settle upon some special breed of horse, cow, sheep, or hog, and try to being it as near perfection as possible, so that this particular strain shall be especially desirable and command an extra price. And so I might go on enumerating indefinitely, but I have given enough to illustrate my point, that our success depends upon our knowledge of the business and the care and accuracy with which we do our work; and I am sure I know of no occupation that presents a wider or more inviting field to the young man whose tastes run in that direction.

In looking around over the families of prosperous farmers, we find when the sons arrive at the age of manhood, the bright ones generally leave home and either study a profession or go into business in the city, while the dull ones are left to keep the farm.

In every city, we find a few successful merchants and professional men, who, by their own energy and superior business ability, have worked their way up from a very lowly station until they have become the most wealthy and influential men in a great city. These are very properly held up as an example to the boys on the farm and elsewhere. But, while we are all familiar with the names of the few successful ones, we never hear of the hundreds and thousands who fail. Bright boys who have left home full of life, and hope, and high ambition, carrying with them the blessings and fondest hopes of loving parents, who have, by some unforeseen circumstance, or perhaps misstep, lost their hold upon fortune, and have never been able to regain it, but struggle along constantly oppressed by adverse fate, live their few brief years of toil and hardship amid the heat and dust and turmoil of the city, always hoping for something better, always disappointed, until at last, worn out by the effort and utterly discouraged, they drop out of the race and are never missed, their places having been filled in advance by other bright boys from the farm.

Those who fail, by far outnumber the men who succeed. Many have gone to the city to engage in business, and, after a few years, have died

discouraged and broken-hearted, who would have lived a life full of comfort and enjoyment had they remained on the farm.

The impression used to prevail that the farmer did not need education; that it would rather prove a hindrance to his success, and until very lately what was called book-farming was ridiculed, and farmers who read books relating to their profession were regarded with distrust. Even at this late day, after the advantages of education have been so clearly demonstrated, we find some good farmers, men apparently of sound sense and good judgment in other respects, who hold the opinion that the best kind of education for a boy who intends becoming a farmer is that which trains his hands to the use of tools, and which treats entirely of the mechanical details of his business, leaving out entirely the great principles that underlie the science of agriculture, and all branches of learning that have not a direct bearing upon the work of the farm.

I hold that the farmer cannot be too well educated. He needs literary training to enable him to draw the greatest benefit and fullest enjoyment from a quiet home during the comparatively idle days and long evenings of winter—for what is leisure without books? and just in proportion to the breadth of his knowledge will be his success. It stands to reason that, since he has to make daily use of the forces of nature to carry on his business, since he does not arrive at a single result in all his operations without the aid of nature, which always works according to fixed and unalterable laws, the best preparation he can have for the successful prosecution of his work is a thorough knowledge of the natural sciences, a knowledge of the principles that underlie all changes that are constantly taking place around him—in the air, in the earth, in the plants that grow upon the earth, and the animals that feed upon these plants.

I do not mean to convey the impression by anything I have said that the farmer does not need to work; that his life is one long holiday, spent under wide-spreading trees in shady lanes and on the banks of cool and pleasant streams. Far from it. I do not think such a life would be desirable. The man who does not have to work does not have the capacity to enjoy his leisure to the full, and gets only one fourth the pleasure out of life that he is entitled to. It is this consciousness of duty faithfully performed that enables a man to enjoy properly his hours of rest, and it is only by close attention to business, and by the most unceasing vigilance, that the farmer is enabled to succeed and hold his position among other business men.

But, if you will go with me through any of our best agricultural districts, and observe the farmers at their work and in their homes, you cannot help but notice the sturdy, robust bodies, fully able to do the work with ease that they are called upon to perform, and the jovial, contented look upon their faces, even in the busiest season.

Now, go stand on a street corner in the business portion of one of our large cities and watch the crowd as they pass; see how they hurry as if their lives depended upon getting to their destination immediately; how anxious they look, how many careworn faces bearing the stamp of overwork and disease plainly upon them! Or, go further, to the stock exchange, grain exchange, or gold room, and look at that crowd; see how they push and jostle each other; how their eyes protude; how they yell their orders to the auctioneer; how their entire frames are shaken and swayed with excitement; what a perfect babel they live in! Mark the utter despair of the man who has just lost his all by an unforeseen change in the market. Compare the expression of those men with that of the farmer you have just been looking at, and then tell me how long should a young man of quiet taste and domestic habits hesitate before choosing an occupation?

THE SETTLEMENT OF THE SOUTHERN BORDER COUNTIES BY THE SCOTCH-IRISH.

By J. SIMPSON AFRICA, *Secretary of Internal Affairs.*

[Read at the Autumn Meeting.]

The claim of England to dominion over Ireland dates from the conquest of Henry II, in 1171. The history of that island during several succeeding centuries is a record of continued oppression, provoking frequent outbreaks on the part of the native inhabitants, whose rebellions occasionally attained temporary success.

Under Elizabeth and James I, confiscation of the estates of Irish rebels vested in the crown the title to over five hundred and eleven thousand acres of land. These and other forfeitures gave the reigning sovereign the disposal of almost the entire territory of the counties of Antrim, Armagh, Caven, Derry, Donegal, Down, Fermanagh, Monaghan, and Tyrone, constituting the Province of Ulster, from which the natives had been driven by the force of arms. James was king of Scotland, reigning as James VI, and at the death of Elizabeth, March 24, 1603, he inherited the crown of England, with which that of Scotland then became united. Scotland had become Protestant, and James encouraged his Presbyterian subjects to cross the North Channel and occupy the lands in the northern part of the island, from which the native population had been banished. The coasts of the two countries approaching within twenty miles of each other, the water passage was easily accomplished, and thousands of sturdy Scots, with their wives and bairns, accepted the invitation, and, seeking homes in this new territory, took lands upon long leases. Their first church was built in the county Antrim, in 1613. Ulster had been the most turbulent Province of Ireland, but soon became. by the industry, thrift, and culture of the new immigrants, the most civilized and prosperous. Soon after the accession of Charles I, in 1625, the peace of Scotland and of Ulster began to be disturbed. The zealous head of the Established Church of England, with the sanction of royal authority, attempted to force the Episcopal form of worship upon the unwilling Scots. They were subjected to many indignities, and suffered personal chastisements, even to the maiming of body or limb. Acts of uniformity were passed that became intolerable. Their ministers were ignored, and marriages performed by them declared illegal, their children treated as illegitimate, and schools not under the charge of a parish priest were forbidden. These and other provocations brought about the formation, March, 1638, of the National Covenant—a bond of union to resist all attempts of the sovereign to enforce innovations upon their cherished forms of religious worship. While Charles and his supporters were endeavoring to force his subjects in Scotland and Ulster into the observance of the acts of uniformity, the native Irish were seeking an opportunity of striking a blow toward expelling the inhabitants of Ulster and restoring their religion, and in 1641 they fell upon and murdered many thousands of the settlers. Gradually the enforcement of the obnoxious measures of the government was relaxed, and the inhabitants of the Province enjoyed comparative peace.

During more than two and a half centuries, this people, transplanted from Scotland to Ireland, has maintained distinctive characteristics. The early colonists were a select stock, and, differing in race and religion from their immediate neighbors, there was no incentive to intermarriage. When permitted by the government, they zealously instructed the youth in the religious tenets of the parents, and the persecutions to which they were subjected inspired more faith in their creed, and more devotion to their cherished form of church government. To the descendants of these colonists, in America, the inaccurate appellation, " Scotch-Irish," is almost universally applied.

As early as the beginning of the eighteenth century, a few families emigrated from Scotland and the north of Ireland, settling on the waters of the Delaware, and on the eastern shores of Maryland and Virginia. The expiration of some of the Ulster leases, and the refusal of the landlords to sell or re-lease, except on exorbitant terms, was an incentive to emigration. Penn's liberal policy attracted many to his possessions on the Delaware. Some found homes in Philadelphia, but the greatest numbers sought farms in Bucks county, in New Castle county (now in Delaware), and in the valley of the Octoraro, Chester county. In 1714, the tide of immigration, following up the Susquehanna, had reached the valley of Chiquesalungo, now in Lancaster, where the Donegal church was organized in that year. The east bank of the Susquehanna, as far up as the Kittochtinny mountains and the fertile lands on the Conewago, Swatara, Manada, and Paxtang, were dotted with settlements in 1722. It is claimed that the Derry church was organized before 1725, Paxtang in 1729, and Hanover some years earlier than 1735. The assessment lists of Donegal township for 1725, (then in Chester county,) and those of Derry, Paxton, and Hanover for 1750, (then Lancaster county,) contain only a few names that are not Scotch.

The Indian title to the land bounded by the Susquehanna on the north-east, the Kittochtinny mountains on the north-west, and Maryland on the south, was not fully vested in the Proprietaries of Pennsylvania until 1736, but a dispute with Maryland about the true location of the boundary line, and intrusions by Marylanders upon lands clearly within this province, induced the Proprietaries to issue licenses to settlers, and to encourage settlements, so as to more successfully resist the intruders. This was done with the consent of the natives. The land office was opened in January, 1737, for the sale of lands in this territory. A temporary line was agreed

upon with the Maryland officials in 1739, which served to preserve peace between the border inhabitants until the famous Mason and Dixon's line, established in 1767, put an end to the long-continued boundary controversy.

The Scotch and Scotch-Irish settled in considerable numbers in 1734, 1735, and 1736, in the "York barrens," included in the south-eastern part of York county, between the Susquehanna and the Maryland line. A few were to be found on the "red lands," north-west of the town of York. John and James Hendricks, members of a family long resident on the east side of the Susquehanna, made, in 1729, the first authorized settlement in the county of York, on Kreutz creek, Hellam township. The first Presbyterian church in the county was "Slate Ridge," in Peach Bottom township. A stream of immigration reached the head-waters of Marsh creek, Adams county, about 1740, where their first church was erected. In the territory of both York and Adams, the Scotch-Irish were the pioneers, and, although subsequently outnumbered by the Germans, a large percentage of names of that nationality can yet be found among the inhabitants. The two nationalities did not dwell together in peace, and, in view of the feuds occurring in York, as well, perhaps, as to make use of the Scotch-Irish, whom they regarded as a pugnacious race, as a defense to the frontier, the proprietary government encouraged them to settle in the Cumberland, then known as the Kittochtinny, valley.

The Chambers brothers, Benjamin, James, Robert, and Joseph, natives of the county Antrim, Ireland, settled first at the mouth of Fishing creek, Dauphin county, in 1726, and there built a mill. Attracted by the fertile lands and beautiful streams of the valley west of the Susquehanna, they explored it, and about 1730 selected locations for settlements—James at the Green spring, Robert at Middle spring, and Benjamin and Joseph at the Falling spring. After the treaty of 1736 opened the valley to settlement, a stream of immigrants poured along it, some from east of the river and many from across the ocean. Farms were opened and dwellings erected at choice locations as far west as the Potomac, and, in a few years, on the waters of the Yellow-Breeches, Conodoguinet, Conococheague, and Antietam, were to be found the comfortable homes of a large, prosperous, and intelligent population. With the increase of population, the religious obligations of the inhabitants were not neglected, as is attested by the organization of churches throughout the valley from 1736 onward, as their necessities or convenience demanded.

Cumberland county was taken from Lancaster, January 27, 1750, and Franklin from Cumberland, September 9, 1784. The names on the early assessments of both counties are chiefly Scotch-Irish. Soon after the formation of Cumberland, the valley, which was known as the "Kittochtinny," or "North" valley, was designated by, and yet retains, the name of the county. The boundaries of the county, as fixed by the act erecting it, included all the lands in the Province northward and westward of the county of York, but no settlements could be lawfully made westward of the Kittochtinny until after the purchase from the Indians, July 6, 1754. The deed then executed by the chiefs of the Six Nations to the Proprietaries conveyed to them all of the lands in the central, north-western, and southern parts of the Province for the insignificant sum of 400 pounds, New York currency. The Indians soon after complained that they did not understand the points of the compass mentioned in the deed, and would never agree to its sweeping boundaries. Many of the tribes finding their lands gone, allied themselves with the French, and manifested their resentment in the defeat of Braddock's expedition. This was closely followed by Indian incursions to the frontier settlements, during which defenseless inhabitants were murdered or carried into captivity, their houses burned, or they subjected to such other cruelties as the inflamed savages could devise.

Better counsels prevailed, and in 1758 another deed was executed in which the purchase of 1754 was limited on the north to lines passing from the Susquehanna through Snyder, Union, and Centre counties to the Allegheny mountains, and to run thence along said mountain to the southern line of the Province; thence eastward to the Kittochtinny, and thus was confirmed to the Proprietaries the Indian title to the lands included in the north-western part of Franklin, southern parts of Snyder, Union, and Centre, and in Perry, Juniata, Mifflin, Fulton, Huntingdon, Blair, and Bedford. The families that suffered between 1754 and 1758, as well as the brave men who fell in the numerous defensive measures resorted to, up to and including the successful expedition to Kittanning, under the command of the heroic Colonel John Armstrong, were chiefly Scotch-Irish. Restraints upon settlements in the last purchase being removed, and comparative peace restored, streams of immigration poured into its fertile valleys, and this region soon became a strong Scotch-Irish colony. This race, inclined to travel toward the setting sun, and thirsting for more conquests, found its ambition gratified, when, by the purchase of 1768, the lands beyond the Allegheny, extending to the western boundary of the Province, were opened to settlers. Through the several passes across the mountain-wall dividing the waters of the Atlantic from those of the Ohio, could be seen the pack trains of these hardy pioneers carrying their families and household goods to spots selected for homes on the then far-western frontier. Few persons, in these days of progress, fully realize the privations to which these pioneers were subjected. The only means of transportation was by pack-horses. There were no roads upon which wheeled vehicles could be used, and no inns where the weary travelers could rest or seek refreshment. Swollen streams were to be forded, and oft-times wild game was wholly relied upon for food. When the selected spot was reached, a cabin was to be erected, land cleared, and grain raised. There was no exemption from labor; all of the family, old and young, male and female, were required to lend willing hands to make home endurable, and to gather the absolute necessaries of life. In such a practical school were the early Scotch-Irish set-

tlers of southern Pennsylvania and their children educated. From them descended a hardy, intelligent, and self-reliant race.

The Foot-Prints of the Early Scotch-Irish Settlers.

Local Names.

No people can long inhabit any district of country without leaving vestiges of their occupation. In the region now under notice, the names of the principal streams and mountain ranges, a few of which have been mentioned, are enduring legacies from the red man. These are generally significant and euphonic. The local political divisions furnish traces of Scotch, Scotch-Irish, and Irish occupation. The names of some of these were bestowed by the civil authorities as compliments to the residents, and many others were suggested and adopted out of respect for the cherished recollections of these people for their former homes across the Atlantic. Among the township names may be mentioned:

In *Chester* county, Londonderry, (1734;) *Lancaster*, Colerain, Donegal East and West, Drumore, Fulton, and Rapho; *Dauphin*, Derry, (1729,) Hanover, (1739,) and Londonderry, (1785;) *York*, Monaghan; *Adams*, Berwick, Menallen, Straban, and Tyrone; *Franklin*, Antrim, (1741,) Fannett, (1761,) Guilford, (1751,) Lurgan, (1743,) Montgomery, (1781;) *Perry*, Tyrone, (1761,) Toboyne; *Juniata*, Fermanagh, (1767,) Lack, (1761;) *Mifflin*, Armagh, (1770,) Derry, (1767;) *Huntingdon*, Brady, (1846,) Dublin, (1767,) Henderson, (1814,) Porter, (1814;) *Fulton*, Ayr, (about 1760,) Belfast, (about 1793,) Dublin, (1767); *Bedford*, Colerain, (1767,) Londonderry, Napier, and St. Clair; *Blair*, Catharine, (1846,) Blair, Tyrone, (1787;) *Westmoreland*, Donegal, Derry, Mount Pleasant, (1771,) Rostraver, (1771,) and St. Clair; *Fayette*, Dunbar, (1798,) Menallen, (1783,) Tyrone, (1771;) *Washington*, Donegal, East and West Finley, Mount Pleasant, North and South Strabane; *Allegheny*, Upper and Lower St. Clair, and several others of modern creation, named in honor of distinguished citizens of Irish and Scotch extraction.

William Penn being an English Friend or Quaker, he naturally sought settlers for his province among his co-religionists of England, and of them the first immigrants chiefly consisted. They constituted a majority of the early inhabitants of the colony, and were placed in control of the legislative and executive branches of the Government and retained it down to the Revolution. During the first half of the eighteenth century, the Irish, Scotch, and Germans of the interior increased rapidly in numbers, but the system of representation in the Assembly was such that their influence in the councils of the province could not be felt to the extent that they ought to have been entitled to. The prevalence of the English sentiment may be noticed in the naming of the counties and county-towns laid off before the Proprietary government was ended by the Revolution. With the exception of Philadelphia, all the counties created during that period, as well

as the original county-towns, generally bear names derived from the shires or shire-towns of England. But as the population increased and other villages grew up in Scotch and Irish communities, they were designated by titles given in honor of the birth-places of some of these settlers or of pioneers or prominent citizens of their own nationality. Among these may be noted:

Gettysburg and Berwick borough in Adams; Hogestown, New Kingston, Lisburn, and Whitehill in Cumberland; Chambersburg, Mercersburg, Green-Castle, Scotland, Orrstown, and Fannettsburg in Franklin; Duncannon in Perry; Patterson and McAllisterville in Juniata; McVeytown, Newton Hamilton, and Reedsville in Mifflin; Orbisonia, Ennisville, and McAlevy's Fort in Huntingdon; Hollidaysburg, Newry and Tyrone in Blair; McConnellsburg and Speersville in Fulton; St. Clairsville in Bedford; Connellsville and McClelland town in Fayette; Derry, Mount Pleasant, Murraysville, Robstown and Pleasant Unity in Westmoreland; Canonsburg and Beallsville in Washington; McKeesport, Ormsby, and St. Clair in Allegheny.

Churches and Schools.

Donegal presbytery was organized in 1732, and embraced the whole of Lancaster county at that date. Some years later that of Carlisle was formed from it. Redstone, embracing the territory west of the Allegheny mountain, was organized September 19, 1781. Huntingdon was taken from Carlisle in April, 1795, and was bounded on the west by Redstone. These four presbyteries included nearly all the Scotch-Irish settlements in the southern border counties. The first ministers were natives of Scotland or the North of Ireland, and were educated before coming to America. A necessity soon arose for educating young men for the ministry in this country, and, in 1726, Rev. William Tennent, a native of Ireland, was called to the Neshaminy Presbyterian church, in Bucks county, and the same year established a theological school, long known as the Log College, near Hartsville, in that county, being the first institution south of New England at which candidates for the ministry could be educated. From this college graduated some of the most distinguished divines of the last century. Rev. Samuel Blair, a native of Ireland, and a graduate of the Log College, in 1740 accepted a call to the New Londonderry congregation at Fagg's Manor, Chester county, and there established a school similar to the one in which he received his theological instruction. This school, after his death, was continued for about nine years by his brother John, also an alumnus of the Log College. Francis Allison, D. D., born in Ireland, and educated at the University of Glasgow, in 1735 became pastor of a Presbyterian congregation at New London, Chester county, and, in 1743, opened an academy at that place. Rev. Samuel Finley, also a native of Ireland, who completed his education at the Log College, in 1744 accepted a call to Nottingham, Chester county, and there conducted an academy, intended

for preparing young men for the ministry, which acquired such a reputation as to attract students from a great distance. Dr. Finley was elected president of Princeton College in 1761, and died while holding that position. Rev. Robert Smith, D. D., another graduate of the Log College, who was installed as pastor at Pequa, Lancaster county, in 1750, there established a classical and theological institution of high character.

Beside the array of prominent Presbyterian divines attaining eminence in the pulpit, or as presidents of colleges, who were educated at these institutions, there were many others enrolled as students who became distinguished in different callings.

Among these may be mentioned Charles Thomson, Secretary of the Continental Congress; Dr. John Ewing, Provost of the University of Pennsylvania; Dr. David Ramsey, historian; Governor Thomas McKean, George Read, and James Smith, three signers of the Declaration of Independence; Governor Martin of North Carolina, Governor Henry of Maryland, Dr. Benjamin Rush, and Ebenezer Hazard.

Rev. John King, born in Lancaster county in 1740, a son of a Presbyterian minister, opened a classical school on West Conococheague in the Cumberland valley in 1760. The Indian war compelled him to leave the valley a few years later. He entered the college of Philadelphia and graduated there in 1766; was licensed to preach in 1767, and, returning to the valley, assumed pastoral duties and also devoted attention to instructing candidates for the ministry. The first person to promote education west of the Allegheny was Rev. Thaddeus Dod, who located at Fort Lenally, in the Redstone settlement, in 1778. Rev. John McMillan, D. D., born in Chester county in 1752 of Irish parents, was educated under Rev. John Blair, in his native county, and Rev. Robert Smith at Pequa. Entering Princeton college, then under the charge of that great theologian and patriot, Dr. John Witherspoon, in 1770, he graduated in 1772; was licensed in 1774, and, in 1778, moved his family to the vicinity of his charges of Chartiers and Pigeon creek.

Dickinson college, at Carlisle, was established in 1783 by the Presbyterians of the valley. It is now under the control of the Methodist Episcopal church. Jefferson, at Canonsburg, was founded 1802; Washington, 1806; Jefferson Theological school, Canonsburg, 1802; Western Theological seminary, Allegheny, (P.,) 1825; Allegheny City Theological seminary, (U. P.,) 1825, and the Allegheny Theological institute, (R. P.,) 1840; Waynesburg, 1850; Lincoln University, Lower Oxford, Chester county, 1853.

The Revolution.

No class of the population of Pennsylvania took a more conspicuous and active part in the contests between the British government and the colonies than the Scotch-Irish people.

With a keen recollection of the persecutions and oppressions they or their ancestors had endured in Scotland and Ireland, resulting in their migrating to the wilds of America, where they could erect their altars and worship God according to their own cherished form, this people were eager for an opportunity to strike a blow against British oppression and in favor of American Independence. From the passage of the odious "Stamp Act" in 1765, in all the movements made to resist the encroachments of the Crown upon the liberties of the colonists, the Pennsylvania Scotch-Irish took an active and prominent part. Congress, in June, 1775, authorized the raising of eight companies of expert riflemen in Pennsylvania for the defense of the colonies. *Nine* were organized and marched at once to Boston. Six were from the counties on the southern border, and their rolls reveal a large percentage of Scotch and Irish names. The places of enlistment and names of the captains of these companies were as follows:

James Chambers, in that part of Cumberland now Franklin; Robert Clugage, Bedford, now Huntingdon and Fulton; Michael Doudel, York and Adams; William Hendricks, Cumberland; James Ross, Lancaster and Matthew Smith, Lancaster, now Dauphin. This battalion was commanded by Colonel William Thompson of Carlisle. Edward Hand of Lancaster was lieutenant colonel, and Robert Magaw of Carlisle, major. Chambers was afterward advanced to the rank of colonel, and remained in the service until the close of the war. In 1776, the Cumberland Valley furnished companies commanded by Captains Reverend Steel, Postlethwaite, Galbraith, McCune, Turbett, McConnell, Huston, Clark, Hutton, Culbertson, Licher, Schneider, and Watts, and probably others. Other districts were equally patriotic, and each county along the southern border contributed liberally of men and means for the common defense. An examination of the military rolls shows that the Scotch-Irish people were always ready to risk their lives in the struggle for independence. It is to be regretted that circumscribed limits will not permit a more detailed account of these heroes and their trials.

The Constitution of the Commonwealth of 1776 was framed by a convention composed of eight delegates from the city of Philadelphia and the same number from each of the eleven counties then existing.

A large majority of the southern border members were of the Scotch-Irish race. Of the signers of the Declaration of Independence from this colony, James Wilson of Cumberland was a Scotchman, and James Smith of York and George Taylor of Northampton were natives of Ireland.

Civil Officers.

The only President of the United States chosen from Pennsylvania was a son of an immigrant from the North of Ireland. The same race has furnished, since the adoption of the Constitution of 1790, eight Governors of the Commonwealth, viz:

Thomas McKean, William Findlay, David R. Porter, William F. Johnston, James Pollock, Andrew G. Curtin, John W. Geary, and Robert E. Pattison, the most of whom were either natives of, or were chosen from, the

counties adjacent to the southern border. The list of cabinet-officers of the United States from this Commonwealth, and the roll of Representatives in both branches of Congress, reveal a large percentage of Scotch-Irish names.

In removing the forest and preparing our valleys for the habitation of man; in establishing schools and colleges, and erecting churches; in defending the frontiers from the ravages of the Indian; in resisting the oppressions of a British monarch and his Parliament; in taking up arms for the defense of that Declaration of Independence which has been the admiration of the civilized world; in efforts to spread general education, and to contribute to the material wealth of this great country, no class of people has been more efficient than the Scotch-Irish element of our southern border counties.

Tabular Statement of a Record of the Weather, kept at Quakertown, Pennsylvania, for the year ending November 30, 1884, by J. L. HEACOCK.

	December, 1883.	January, 1884.	February, 1884.	March, 1884.	April, 1884.	May, 1884.	June, 1884.	July, 1884.	August, 1884.	September, 1884.	October, 1884.	November, 1884.	Averages & amount of rain-fall, etc., for the year.
Highest temperature,	52.	42.	52.	59.	68.	81.	88.	86.	88.	89.	78.	60.	70.25
Lowest temperature,	4.	—2.	2.	—2.	28.	37.	41.	52.	45.	39.	27.	17.	24.
Average temperature,	30.66	22.55	32.34	34.19	46.06	57.59	66.53	67.55	68.32	65.86	53.26	40.03	48.74
Greatest temperature, mean,	38.13	30.09	38.51	41.97	55.20	66.80	78.26	76.22	77.48	76.66	62.77	48.70	57.31
Lowest temperature, mean,	22.03	15.06	26.21	25.80	35.23	48.19	55.76	59.20	59.13	54.90	43.77	31.43	39.72
Daily range of temperature, greatest,	32.	30.	27.	30.	31.	35.	36.	28.	26.	31.	30.	29.	30.41
Daily range of temperature, least,	4.	3.	4.	4.	9.	5.	8.	7.	7.	13.	4.	3.	5.09
Daily range of temperature, average,	16.09	15.42	9.	15.63	18.56	20.19	21.16	17.09	18.36	22.	19.	17.26	17.48
Monthly range of temperature,	48.	44.	50.	61.	40.	44.	47.	34.	43.	50.	51.	43.	46.25
Barometer, highest,	29.78	29.95	29.86	29.56	29.34	29.46	29.68	29.19	29.49	29.66	29.88	29.75	29.63
Barometer, lowest,	28.66	28.27	28.52	28.71	28.41	28.83	28.88	28.82	28.88	28.87	29.02	28.93	28.56
Barometer, average,	29.27	29.27	29.22	29.20	29.05	29.09	29.27	29.06	29.25	29.26	29.45	29.40	29.23
Barometer, daily fluctuations, averaged,	.12	.13	.13	.12	.08	.08	.09	.07	.05	.08	.11	.13	.10
Amount of rain-fall and melted snow,	2.15	2.96	4.74	4.99	2.70	3.53	6.54	7.92	3.76	.53	4.38	3.53	47.73
Number of days upon which rain and snow fell,	13	11	16	15	8	14	10	14	11	5	9	9	135
Number of days fair,	6	11	12	12	13	11	7	9	10	8	10	11	120
Number of days clear,	9	6	0	2	4	5	11	7	9	17	9	9	88
Number of days cloudy,	3	3	1	2	5	1	2	1	1	0	3	1	23

REMARKS.—Our remarks in our last report, in relation to the meteorological instruments, is the same, except the rain-gauge, which is located about five feet above the ground. Frost every month, in this locality, in low places, except July. Earthquake shocks were felt on the 10th of August, at 2.10, P.M., which lasted about four seconds. Crops were good, and no damage, by storms, occurred during the year worth mentioning. Red sunsets were frequent during the year. No other meteorological phenomena noticed.

TABULATED ANALYSES OF FERTILIZERS ISSUED BY THE PENNSYLVANIA BOARD OF AGRICULTURE.

By Prof. W. H. JORDAN, *Chemist of the Board of Agriculture.*

From samples selected by the Secretary of the Board, or by its duly appointed agents, in accordance with the provisions of the act of June 28, 1879. The valuations are by Prof. Jordan, and are based upon the following rates:

NITROGEN in nitrates, 20 cents; nitrogen in ammonia salts, 26 cents; nitrogen in Peruvian guano, fine-steamed bone, dried and fine-ground blood, meat, and fish, superphosphates and special manures, 23 cents; nitrogen in coarse or moist blood, meat or tankage, in cotton-seed, linseed, and castor pomace, 18 cents; nitrogen in fine-ground bone, horn, and wool dust, 17 cents; nitrogen in medium bone, 14 cents; nitrogen in coarse bone, horn shavings, hair, and fish scraps, 11 cents; PHOSPHORIC ACID, soluble in water, 11 cents; phosporic acid, "reverted," and in Peruvian guano, 8 cents; phosphoric acid, insoluble, in fine bone and fish guano, 6 cents; phosphoric acid, insoluble, in medium bone, 5 cents; phosphoric acid, insoluble, in coarse bone, bone-ash and bone-black, 4 cents; phosphoric acid, insoluble, in fine-ground rock phosphate, 2¾ cents; POTASH in high-grade sulphate, 7 cents; potash in low-grade sulphate and kainite, 4½ cents; potash in muriate or potassum chloride, 4¼ cents.

Complete Fertilizers.

Record number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	WHERE SELECTED.	Moisture.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Nitrogen.	Estimated value per ton.	Record number.
190	Twenty-five Dollar Phosphate,	Baugh & Sons, Philadelpeia,	Media,	10.98	4.45	2.28	3.98	0.15	1.58	25.62	190
191	Good Enough Phosphate,	M. L. Shoemaker & Co., Philadelphia,	do.	16.12	6.55	3.46	3.11	1.06	1.54	31.69	191
193	Swift Sure Dissolved Bone,	do. do.	do.	9.76	8.71	3.47	4.97	0.51	2.75	43.75	193
196	Echo Superphosphate,	do. do.	West Chester,	13.17	4.67	3.71	3.94	1.19	1.16	27.29	196
197	Ammoniated Dissolved Bone,	do. do.	do.	12.33	5.17	4.30	4.04	0.43	1.50	30.36	197
199	Bonanzo Phosphate,	Manning & Ames, Hagerstown, Md.,	Newville,	10.05	. . .	4.94	5.78	2.95	0.86	21.29	199
200	Home Fertilizer,	Slingluff & Co., Baltimore, Md.,	do.	24.97		1.85	0.41	1.12	1.09	9.41	200
201	Maximum Phosphate,	G. T. Dunlop, Washington, D. C.,	do.	12.52	3.51	1.74	4.35	1.53	2.84	30.08	201
203	Locust Point Compound,	G. Ober & Sons, Baltimore, Md.,	do.	17.77	7.36	3.90	2 30	1.35	1.36	31.40	203
206	Phosphoric Acid and Potash,	W. A. Hooveler & Co., Pittsburgh, Pa.,	Chartiers,	14.05	5.63	2.69	0.92	3.37		19.94	206
207	Sea Fowl Guano,	Rradley Fertilizer Company, Boston, Mass.,	do.	13.80	7.97	2.60	2.73	0.70	1.83	33.98	207
208	Ammoniated Dissolved Bone Phosphate,	Lister Brothers, Newark, N. J.,	Bloomsburg,	20.00	8.15	1.92	0.72	0.86	1.76	30.58	208
209	Royal Bone,	Williams, Clark & Co., New York,	do.	19.80	4.02	3.30	2.12	1.50	1.49	25.61	209
210	Universal High Grade Fertilizer,	do. do.	do.	15.00	5.20	4.89	1.24	0.22	1.93	29.81	210
211	Americus Ammoniated Phosphate,	do. do.	do.	20.50	6.23	4.74	1.89	0.77	2.21	34.38	211
214	Dissolved Bone Phosphate,	Joshua Walker, Baltimore, Md.,	do.	16.43	3.92	6.62	3.13	0.31	0.94	27.54	214
216	Davidges' Soluble Bone,	Russell Coe, New York,	Danville,	11.32	5.01	1.43	4.67	0.84	0.47	21.77	216
217	Davidges' Special Favorite.	do. do.	do.	17.48	4.49	2.53	4.78	1.31	1.40	27.22	217
218	Sangston's Plant Food,	Maryland Fertilizer Co., Baltimore, Md.,	do.	19.21	5.13	4.59	2.85	1.59	1.19	28.88	218
219	Ralston's Potato Fertilizer,	J. Ralston, Now York,	Scranton,	13.33	7.32	1.69	3.43	1.88	2.10	34.18	219
220	Bone Superphosphate,	do. do.	do.	13.98	7.41	1.90	2.21	0.49	1.77	30.54	220
221	Ammoniated Superphosphate,	L. L. Crocker, Buffalo, No. Y.,	Tunkhannock,	14.86	7.00	1.74	2.34	0.77	3.19	36.31	221
223	Good Enough Phosphate,	M. L. Shoemaker & Co., Philadelphia,	Hamburg,	12.79	7.39	2.20	3.67	1.60	1.49	32.39	223
224	Echo Phosphate,	do, do,	do,	12.83	5,04	2,35	4.35	1.09	1,44	27.61	224
225	Buffalo Ammoniated Phosphate,	L. L. Crocker, Buffalo, N. Y.,	Chartiers,	10.18	6.70	1.46	2.96	0.71	3.36	36.66	225
226	Standard Phosphate,	Standard Phosphate Company, Bethel, Pa.,	do.	12.44	3.97	4.63	2.66	1.93	0.25	22.12	226
227	Smoky City Phosphate,	J. & R. Young, Pittsburgh, Pa.,	do.	11.05	1.67	4.03	3.16	1.76	1.48	22.32	227
228	Ammoniated Phosphate,	W. A. Hooveler & Co., Pittsburgh, Pa.,	do.	8.50	3.18	4.07	7.61	1.49	2.35	33.11	228
230	Pure Bone Phosphate,	Susquehanna Fertilizer Co., Baltimore, Md.,	Oxford,	. . .	4.86	4.82	2.79	1.43	2.29	33.49	230
231	Ammoniated Bone Phosphate,	do. do. do.	do.	. .	5.37	2.51	4.77	0.89	1.44	28.92	231
237	Elipse Bone Phosphate,	W. Ewing, Landenburg, Pa.,	do.	14.70	4.80	3.53	2.18	0.89	1.45	26.25	237
239	Ammoniated Bone Phosphate,	H. Cope & Co., Lincoln University, Pa.,	do.	12.80	2.79	3.77	3.24	1.29	1.40	25.79	239
240	Pure Bone Phosphate,	do. do.	do.	9.94	4.17	4.87	4.25	0.61	2.35	33.39	240
241	Bone Phosphate,	S. McDowell, Oxford,	do.	10.75	2.98	1.67	4.38	2.56	1.38	23.02	241
242	Raw Bone Phosphate,	Baugh & Sons, Philadelphia, Pa.,	Toughkenamon,	8.09	4.22	5.42	5.92		1.38	31.30	343
244	"A B" Phosphate,	W. Kenderdine, Lumberville, Pa.,	Holicon,	14.70	3.78	3.50	5.10	4.15	2.35	34.38	244
245	"A A" Phosphate,	do. do.	do.	15.43	4.89	2.33	2.59	3.55	2.77	31.76	245
247	Ammoniated Soluble Bone Phosphate,	J. Gawthrop & Co., Kennett Square,	Kennett Square,	12.10	3.79	3.04	4.80	1.37	1.31	26.35	247
251	Tornado Fertilizer,	Maryland Fertilizer Co., Baltimore, Md.,	Montgomery,	15.40	6.40	3.27	2.87	2.99	0.31	24.99	251
252	Linden Fertilizer,	do. do.	do.	15.71	6.73	4.17	2.41	1.16		23.78	252
254	U. S. Phosphate,	Lister Brothers, Newark, N. J.,	do.	19.90	4.99	0.93	0.71	1.54	1.21	20.20	254
256	Bradley's Phosphate,	Bradley Fertilizer Company, Boston, Mass.,	do.	14.72	8.99	2.55	1.30	0.58	2.12	35.67	256
257	High Grade Ammoniated Phosphate,	E. Frank Coe, New York,	do.	12.13	7.31	2.06	2.22	0.68	2.01	31.88	257
258	Knickerbocker Phosphate,	J. Ralston, New York,	do.	16.19	6.47	3.24	2.37	0.65	1.62	30.29	258
260	Superphosphate,	J. Trinley, Limerick Station,	Royer's Ford,	12.38	5.24	4.64	3.25	0.48	1.51	30.21	260
261	Royal Bone,	Williams, Clark & Co., New York,	Montgomery,	19.60	4.30	3.46	1.18	1.43	1.07	22.50	261
265	Twenty-five Dollar Phosphate,	Baugh & Sons, Philadelphia, Pa.,	Philadelphia,	12.90	3.93	3.59	4.13		1.29	25.28	265
266	National Potato Fertilizer,	U. S. Chemical Company, Philadelphia, Pa.,	do.	14.16	2.37	6.90	1.78	1.75	3.12	34.37	266
269	National Soluble Bone,	do. do.	do.	12.46	6.53	4.67	4.42		0.69	27.44	269
272	National Superphosphate,	do. do.	do.	11.30	5.42	6.87	1.93	0.75	0.89	29.96	272
273	No. 1 Bone Phosphate,	Sharpless & Carpenter, Philadelphia, Pa.,	do.	13 38	3.61	3.98	3.21	1.79	1.18	25.11	273
275	Chester County Bone Phosphate,	U. S. Chemical Company, Philadelphia, Pa.,	do.	10.15	5,95	6.70	2.45	0.39	0.78	28.98	375
276	Ammoniated Bone Phosphate,	Coe & Richmond, Philadelphia, Pa.,	do.	12.38	6.98	2.83	3.18	0.79	2.23	34.56	276
277	National Complete Phosphate,	U. S. Chemical Company, Philadelpaia, Pa.,	do.	11.37	6.29	4.34	1.84	2.28	1.98	34.04	277
279	National Tobacco Fertilizer,	do. do.	do.	14.04	6.74	2.33	1.64	2.22	1.73	30.38	279
281	Soluble Bone Potash,	I. P. Thomas, Cheyney, Pa.,	Hamburg,	15.13	5.95	4.21	3.58	1.30	0.60	28.09	281
282	Farmers' Choice Phosphate,	do. do.	do.	13.40	6.15	3.49	3.52	1.18	0.41	26.22	282
283	Tip-Top Raw Bone Phosphate,	do. do.	do.	12.08	6.60	4.07	3.49	1.93	1.94	35.78	283
285	King Philip Alkaline Guano,	Clark's Cove Guano Co., New Bedford, Conn.,	Somerset,	13.65	4.24	1.02	0.82	8.13	1.60	26.21	285
286	Great Planet "A" Brand,	do. do. do.	do.	16.58	7.10	1.58	1.03	5.08	3.50	39.81	286
287	Unicorn Ammoniated Phosphate,	do. do. do.	do.	17.39	8.13	1.92	1.21	1.90	2.60	35.99	287
288	Susquehanna Bone Phosphate,	Susquehanna Fertilizer Co., Baltimore, Md.,	do.	9.25	5.70	3.77	4.77	0.97	1.40	31.56	288
289	Eureka Fertilizer,	John Uhler, Easton, Pa.,	Easton,	10.70	0.27	1.63	0.47	0.67	1.26	10.03	289
290	Hill and Drill Phosphate,	Bowker Fertilizer Company, Boston,	do.	17.72	5.58	2.98	2.27	0.73	1.45	27.06	290
292	Ammoniated Bone Phosphate,	Susquehanna Fertlizer Co., Baltimore, Md.,	do.	11.07	5.23	3.36	5.25	0.70	1.27	30.63	292
293	Lobos Peruvian Guano,	Christian & Co., Philadelphia,	Philadelphia,	13.11	1.14	6.31	11.65	1.93	5.28	52.52	293
295	Dissolved Bone Phos hate,	Lister Bros., Newark, N. J.,	Apollo,	18.52	9.41	1.59	1.00	0.78	1.89	33.79	295
296	Cambria Phosphate,	Keystone Fertilizer Co., Johnstown, Pa.,	do.	17.25	2.44	3.77	1.66	2.61	0.16	16.25	296
299	Ammoniated Buffalo Phosphate,	L. L. Crocker, Buffalo, N. Y.,	Pittsburgh,	13.27	6.97	2.63	2.87	0.36	3.12	37.63	299
302	Dissolved Bone Meal,	J. L. Cooper Manf'g Co., Wilmington, Del.,	Landenburg,	10.79	3.39	4.03	6.80	1.34	2.00	32.41	302
305	Standard Phosphate,	Keystone Fertilizer Co., Johnstown, Pa.,	Ligonier,	. . . .	4.77	4.35	6.59	0.25	2.21	35.52	305
306	Lion Ammoniated Phosphate,	do. do.	do.	. . . .	7.45	1.15	1.63	0.26	3.47	36.15	306

Ground Bone.

No.	Name and Address of Manufacturer.	Where Selected.	Insoluble phos. acid.	Nitrogen.	Est'd com. value per ton.	No.
194	M. L. Shoemaker Company, Philadelphia, Pa.,	Media,	20.74	5.82	$42 49	194
204	W. A. Hooveler & Co., Pittsburgh,	Chartiers,	20.06	3.35	34 29	204
205	N. W. Fertilizer Company, Chicago, Ill.,	do.	22.68	3.46	38 04	205
233	Susquehanna Fertilizer Company, Baltimore, Md.,	Oxford,	23.50	3.47	39 39	233
236	W. D. Alexander, Oxford, Pa.,	do.	19.13	3.62	33 22	236
238	Washington Ewing, Landenburg, Pa.,	do.	19.60	3.74	34 11	338
248	J. Gawthrop & Co., Kennett Square, Pa.,	Kennett Square,	18.43	2.99	29 21	248
259	M. Berg, Philadelphia,	Philadelphia,	17.20	3.21	27 52	259
267	do. do.	do.	18.79	3.88	32 31	267
270	Baugh & Sons, Philadelphia, Pa.,	do.	22.93	3.61	37 92	270
271	Sharpless & Carpenter, Philadelphia, Pa.,	do.	21.56	3.61	37 25	271
274	Baugh & Sons, Philadelphia, Pa.,	do.	21.86	3.49	36 31	274
294	Lister Bros., Newark, N. J.,	Appolo,	13.23	3.23	27 55	294
298	Allegheny City Fertilizer Works, Allegheny, Pa.,	Pittsburgh,	22.96	3.37	37 18	298
300	do. do.	do.	25.10	4.05	38 09	300

Acidulated S. C. Rock.

No.	Name of Fertilizer.	Name and Address of Manufacturer.	Where Selected.	Moisture.	Soluble phos. acid.	Reverted phos. acid.	Insoluble phos. acid.	Est'd com. value per ton.	No.
192	Dissolved S. C. Rock,	M. L. Shoemaker & Co., Philadelphia, Pa.,	Media,	10.88	7.32	5.32	3.04	$26 28	192
198	Acid Phosphate,	Coe & Richmond, Philadelphia, Pa.,	West Chester,	8.41	9.48	3.59	2.17	27 68	198
202	Alkaline Phosphate,	Zell & Son, Baltimore Md.,	Newville,	7.95	11.70	2.53	.70	30 37	202
212	Acid Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Catawissa,	12.85	9.72	4.71	2.29	30 19	212
213	Acid Phosphate,	D. D. Hess & Son, Reading, Pa.,	do.	11.36	8.22	3.53	2.22	24 95	213
215	Dissolved Phosphate,	Maryland Fertilizer Co., Baltimore, Md.,	Danville,	8.55	10.07	3.63	3.51	29 89	215
222	Acid Phosphate,	Rasin Fertilizer Co., Baltimore, Md.,	do.	13.20	5.37	5.69	3.05	22 58	222
229	Rock Phosphate,	Susquehanna Fertilizer Co., Balto., Md.,	Oxford,	10.65	8.68	5.21	3.61	29 06	229
232	Alkaline Bone Phosphate,	do. do. do.	do.	14.12	6.38	5.12	4.16	24 52	232
243	Dissolved S. C. Rock,	J. Gawthrop & Co., Kennett Square,	Kennett Square	11.00	8.18	3.57	5.27	26 61	243
246	Acid Bone Phosphate,	Coe & Richmond, Philadelphia, Pa.,	West Chester,	9.42	6.44	3.29	2.58	20 85	246
249	Acid Bone Phosphate.	do. do.	do.	8.56	6.37	3.17	2.80	20 62	249
250	Diamond State Soluble Bone,	Lord & Polk, Odessa, Del.,	do.	10.61	6.83	5.86	3.18	26 26	250
253	Soluble Bone Phosphate,	Moro Philips, Philadelphia, Pa.,	Montgomery,	11.08	7.34	4.17	5.23	25 70	253
255	Diamond Soluble Bone,	Walton, Whann & Co., Wilmington, Del.,	do.	13.60	6.01	6.75	2.65	25 47	255
262	Standard Phosphate,	U. S. Chemical Co., Philadelphia, Pa.,	Philadelphia,	10.02	6.79	6.08	3.07	26 36	262
278	Yearsley's Acid Phosphate,	do. do.	do.	11.86	3.10	10.28	2.55	24 42	278
284	Dissolved Bone Phosphate,	Zell & Son, Baltimore, Md.,	Somerset,	8.53	7.73	4.87	4.07	27 03	284
291	Soluble Bone Phosphate,	Susquehanna Fertilizer Co., Balto., Md.,	Easton,	8.49	9.83	4.94	2.80	31 07	291
301	Dissolved Phosphoric Rock,	J. L. Cooper Mnf'g Co., Wilmington, Del.,	Landenburg,	13.63	6.37	6.39	4.16	26 52	301
303	Diamond Soluble Bone,	Walton, Whann & Co., Wilmington, Del.,	Chadd's Ford,	4.10	8.16	6.16	3.72	29 87	303
304	Dissolved S. C. Rock,	Sharpless & Carpenter, Philadelphia,	do.	3.70	8.87	4.79	5.67	30 29	304

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